The
Geographical Journal.

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OPENING ADDRESS BY THE PRESIDENT, 1896–97.

We open the Session with the prospect of much useful and some important work before us; and we can look back upon the Session that is past, and upon the work of the recess, with complacency. We must, I think, specially congratulate ourselves on having made a complete revision of the Bye-laws, which had not been done since the Charter was granted in 1859. This revision will, I feel sure, be conducive to the best interests of the Society. On the one hand, it gives more flexibility and efficiency to the administrative side of the Society's business; and on the other, it has secured a fuller and less trammelled exercise of the rights secured to the Fellows under the Charter, in a way which I believe has given general satisfaction. All well-wishers of the Society may, therefore, entertain a well-grounded hope that perfect harmony will continue to reign amongst us for many years to come.

The fruits of this mutual good understanding are shown in our increasing numbers, in our sound financial condition, and in our work. The *Journal*, under Mr. Keltie's able editorship, not only preserves the high standard of excellence which marked the opening of the present series, but goes on increasing its reputation. This is said to me not only by many of my associates here, but also by foreign geographers wherever I meet them.

Last session the most important communication was the paper on the Pamirs by our Vice-president, Mr. George Curzon, which was printed in three successive numbers of the *Journal*. This paper appeared to me to be so valuable, especially the last part in which Mr. Curzon gives a masterly and exhaustive *resumé* of previous exploration, that I have recommended to the Council that it should be reproduced in book form, accompanied by Mr. Curzon's new map of the

Pamirs. We have also published two other maps of great importance, which contribute new materials to geography. The map of Tibet, illustrating Mr. Littledale's journey, correctly lays down portions of the northern part of the Tibetan plateau for the first time; while Dr. Donaldson Smith's map makes us acquainted with the exceedingly interesting region between Somaliland and Lake Rudolf.

This year has also seen the completion of the great work on the Caucasus by our late secretary, Mr. Douglas Freshfield, which is monumental in its completeness and in the admirable arrangement of the rich materials which compose it. The descriptive parts are alike entertaining and instructive, and the numerous beautiful illustrations are beyond all praise.

We all remember the account which Prince Henry of Orleans was so good as to come over and give us, of his remarkable journey across the headwaters of the Irawadi. We have now received the results of that exploration in the shape of a map drawn by his accomplished and gallant companion, M. Emile Roux, Enseigne de Vaisseau, in the French navy. M. Roux has also written an excellent critical article in the *Annales de Géographie*, reviewing the labours of former explorers, and tracing out the limits of the Irawadi basin. Prince Henry of Orleans and M. Emile Roux are young explorers, but they have already well earned the admiration and high appreciation of their brother geographers.

With due regard to financial requirements, we have endeavoured to provide for the issue of several valuable papers and memoirs which remain in manuscript, and I am glad to be able to announce that General Schindler's paper on Eastern Persia, and Captain Snow's account of the Kuril Islands will soon be ready for delivery.

In the forthcoming Session, our principal and most determined efforts will be turned towards the promotion of an Antarctic expedition. I am sorry to say that I cannot hold out any hope that our Government will resume that glorious work of Antarctic exploration which, until now, has been peculiarly naval work. Still, I venture to anticipate that neither the Imperial nor the Australian governments will withhold assistance and sympathy when the time comes. Meanwhile any well-conceived and properly provided expedition, designed to execute useful exploring work in the far south, will receive the hearty support and co-operation of this Society.

Several papers of great interest will occupy us during the coming Session, among which I may mention Captain Vandeleur's account of his journeys in Uganda, Colonel Trotter on the source of the Niger, Captain Gibbons on the Barotse country, and Sir Martin Conway's account of his Spitzbergen expedition. I also hope to commemorate this session, at an evening meeting, the fourth centenary of the sailing of John Cabot from Bristol. Our afternoon meetings will be engaged, among other subjects, in the consideration of Mr. Vaughan Cornish's

researches into the action of blown sand in the formation of sand-dunes, of Mr. Bedford's paper on the tapestry maps of English counties in the sixteenth century, and Mr. Andrews' views on the teaching of geography in relation to history.

The great event of the Session will be the arrival of Dr. Nansen. We shall receive him, and hear the remarks he has to offer to us, on the subject of his memorable expedition, on the 8th of next February. Dr. Nansen has already received one of our royal awards. But my distinguished friend has since achieved a success which has justly aroused the enthusiastic admiration of the whole civilized world. He is a great explorer from every point of view—in his conceptions, in his scientific attainments, in the completeness of his preparations, in his power over others, in the way he overcomes all obstacles, in his dauntless courage and marvellous endurance. We are resolved to do him honour when he comes amongst us; and I am quite sure that the resolution of the Council, that Dr. Nansen shall be presented with a special gold medal on his arrival, will meet with the hearty approval of the Fellows of this Society.

Still Mr. Jackson and his gallant comrades remain at their posts, exploring the islands of the Franz Josef group, and collecting valuable information in all branches of science with untiring zeal, and in the face of great difficulties and dangers. We do not forget our good friends in Franz Josef Land, but look forward anxiously for news of their welfare and of their achievements. Last year Mr. Montefiore Brice gave us a very short hour of great enjoyment in listening to the admirable way in which he described to us the proceedings of the Jackson Expedition. A year, exactly a year, has elapsed, and we have the pleasure of welcoming Mr. Montefiore Brice amongst us again. He will explain the more recent labours of our gallant Arctic explorers, and I can promise you a most delightful time this evening, in listening to what he is about to tell us.

THE JACKSON-HARMSWORTH POLAR EXPEDITION.*

Notes of the Last Year's Work.

By ARTHUR MONTEFIORE BRICE, F.G.S.

To-morrow it will be exactly a year since I had the honour to submit to this Society a report of the work then accomplished by the Jackson-Harmsworth Expedition. This expedition, as you are aware, was despatched from England in 1894 by Mr. Alfred Harmsworth, a Fellow of this Society, and he placed in command another Fellow of the

* Paper read at the Royal Geographical Society, November 10, 1896. Map, p. 656.

Geographical Society, Mr. Frederick Jackson, who is now wintering for the fourth successive year in the Arctic Regions.

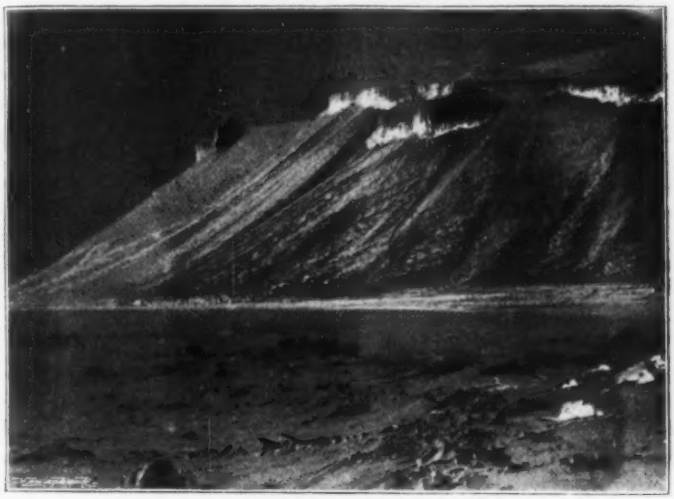
Well, I concluded my paper last year with the hope that this autumn we might again welcome the gallant little *Windward* home, "and with her, too, another and even more important budget of news—news of discovery, news of success, and, best of all, news of well-being and good health."

That hope, I have the highest satisfaction in telling you, has been more than abundantly justified. For the *Windward* herself made a most remarkable passage—sailing under the able and energetic command of Captain James Brown from Vardö, on June 29, navigating some 600 miles of pack-ice, discharging a large and very valuable cargo at Franz Josef Land, and returning to Vardö six weeks to the day after she had left that northern port. She brought with her, too, the good news for which we had hoped—news of systematic exploration and its fruit of valuable discovery; news of successful battling with the well-nigh overwhelming odds which Nature in her Arctic mood presents; and news of the continued and almost unprecedented well-being of our gallant explorers in the great White North.

Moreover, the *Windward* brought the world a great surprise. Rather over three years ago, an Arctic explorer—perhaps the most audacious the world has yet seen—had set sail on a voyage which experience, knowledge, and science regarded with feelings not greatly different from dismay. I allude, of course, to Fritbjof Nansen and his voyage in the *Fram*. On August 3, 1893, he passed through the strait of Yugorski Schar into the Kara Sea, and from that moment he was not merely lost to sight, but to all knowledge or opportunity of knowing. For three long years there was silence and, I think, steadily growing anxiety; and then, when the most sanguine of us were looking for him or news of him from the ice-laden waters of Greenland, and the most desponding were telling us it were vain to look at all, the *Windward* steamed into the fishing-port of Vardö, having on board as passengers Dr. Nansen and his companion Johannesen. The delight and the wonder of it were not confined to what we call "geographical circles," but commanded the attention of that world which honours the courage and applauds the prowess of the polar explorer—a world which is as wide as our globe, and only limited by the distribution of the human race. Of the strange chance that brought it to pass that Nansen and Johannesen should be on the *Windward*, and of what had happened in Franz Josef Land before Mr. Harmsworth's polar yacht had reached Mr. Jackson's quarters, I shall endeavour to give some account a little later. But I have referred to these several points now to remind you how abundantly justified has been that hope that "another and even more important budget of news" would come to our hands this year. It is a year, in fact, which will remain an *annus mirabilis* in the history of discovery.

But I may also note, in passing, that a considerable amount of work of secondary importance has been attempted and, in one or two instances, completed in 1896. Peary has made an interesting voyage into Smith's sound, though it in no way compares, of course, with his magnificent journeys across the great inland ice-cap of Greenland. Andrée has accomplished all but the final flight on his great venture of sailing through the air to the Pole. And Sir George Baden Powell has been able, in his yacht, to afford in Novaia Zemlian waters an exceptional opportunity and a new vantage ground for English astronomers.

We must now return, however, to the summer of 1895, to July 8, when the *Windward* started homeward on that memorable voyage through



CAPE GERTRUDE (*taken with a telephoto lens*).

the ice, which for sixty-three days defied all the efforts of steam-power and the incessant labour of her crew. Exactly three days later—on July 11—Mr. Jackson set sail on a westerly voyage of discovery in the little ship, the *Mary Harmsworth*. This was a whale-boat, rigged with lug-sail and jib, 25 feet 6 inches long, 5 feet 7 inches in beam, and undecked. Accompanying him were Mr. A. Armitage, Lieut. R.N.R., second in command; Mr. H. Fisher, botanist; Mr. J. Child, photographer; Blomvist, an A.B. taken from the *Windward*, and whose record of work in Franz Josef Land is very good; and Mr. S. Burgess, whose place was a day or two later taken by Mr. Reginald Kettlitz, the doctor and geologist of the expedition. The object of this boat journey was to extend our knowledge of the coast-line, to survey and fix the positions of the main points, to enter and explore the intervening fiords and bays, and to

discover, if possible, new land to the westward. The party had a month's provisions with them, some stores for a depôt to be made on Cape Grant, and a canvas boat was towed for additional service and safety. This last was the more necessary as landing-places are few and far between in the almost continuous glacier-wall, which forms a perpendicular face to the coast. Moreover, as we shall see, storms rise suddenly and become severe and dangerous.

On the evening of July 11 the party tied up to the land-floe off Bell island, to find that Eira harbour was full of heavy winter ice, and of no use to the navigator. The next evening they reached Cape Grant, where they established one of the depôts which Mr. Jackson is gradually placing all over this Archipelago—for his own or some other explorer's benefit—and here, too, they left the canvas boat. On the 13th they started again, this time for Cape Crowther; but the sea-ice came in very quickly with the incoming tide, and the boat had several severe nips before she could be got out of the water on to the fast ice of Gray bay. This ice showed no signs of having been broken up that year, and as the sea-ice was still coming in on a strong tide and with irresistible force, Mr. Jackson headed back for Cape Grant. Establishing a camp here, he sent the boat on a mission to Elmwood, the headquarters of the expedition, under the command of Mr. Armitage. Mr. Jackson and his companions in the mean time dredged and made collections of everything that could be procured. He and other members of the party ascended to the summit of Cape Grant by the glacier, and erected a cairn; but on looking over the sea westward, it was evident that the ice was retreating seaward again, and so on the 20th the voyage was renewed. Early on the 21st Cape Crowther was reached, and, bad weather delaying them here for a day, it was utilized in ascending to the summit of the cape, erecting a cairn, and making such observations as were possible. On the 22nd, however, they were able to start again, and late that night they gained Cape Neale. The boat was now sent back to Grant for some provisions, while the remaining members devoted themselves to observing and collecting. The cape was climbed, the usual cairn erected—I may say that in all these cairns a Union Jack was placed—and Mr. Fisher, the botanist, searched for additions to his department, and Mr. Kettlitz, in his capacity as geologist, for rocks and fossils. I may mention, in passing, that Mr. Fisher was able on this journey, as at other times, to make some important and highly interesting sketches.

It was when on the summit of Cape Neale that, the day being clear, Jackson was able to distinguish high land bearing away west of the farthest point previously seen. Anxious to see this new land at closer quarters, he started once more in the *Mary Harmsworth* on the 28th. He sailed across Cambridge bay, and then, and at other times, took every opportunity of mapping it; and at the head of the bay he discovered

a bold and lofty headland which he named Cape Frithjof Nansen. On either side of this headland a strait appeared to lead away to the north and connect with the sea beyond. Passing Cape Ludlow, an unimportant promontory, ice-capped and glacier-faced like the greater part of the coast, he rounded the next point—Cape Lofley—and looked, for the first time at close quarters, upon a cape of majestic if of truly Arctic character. As the boat approached it, the weather suddenly changed for the worse. A storm-cloud lowered in the west; a dense bank of fog came up from the sea. The wind rose to a moderate gale, and set the ice-pack in motion, rendering the position of the boat one of considerable peril. Nevertheless, it was sent slowly ahead, and they drew nearer to the land. Right in front of them the great white headland rose out of the water. At its base there stood a vertical face of ice some 30 feet high; then steep talus, covered with snow and ice, sloped at a steep angle upward to a narrow corona of rocks about 700 feet above; above this, again, came the ice-cap, which rose without a break to an elevation of at least 2000 feet. This cape is one of the most imposing yet discovered in Franz Josef Land, and the circumstances of its discovery were not calculated to depreciate its character. For the storm-cloud which now hung over it loomed very dark; a cold and weird buff-tinted glare flickered ominously beyond on the horizon; the water grew black under the growing darkness of cloud; while the cape rose serene and beautiful from all this gloom—a great mass of pure dead white, with scarcely a perceptible shadow to denote the inequalities of its contour, and blending at its summit as it receded from the sight with the snow-squalls that now whirled round the high cap of ice. Opportunity had, however, been presented for sketching and taking bearings, and the newly found cape received the name of Cape Mary Harmsworth.

It was just at this time, however, that the whole party were nearly lost. The wind had so increased that it blew with the force of a strong gale in gusts, and the broken-up pack allowed a heavy sea to get up. The masses of disrupted ice were in rapid and eccentric motion, and momentarily threatened to crush the boat to matchwood. Neither was there shelter near. The whole of the coast was girded with a wall of ice not less than 30 feet high; there was not even a spit of bare rock, such as occasionally occurs further east, to afford a landing-place.

For two days the gale blew hard, and on the third I find this note: "The gale blowing as hard as ever from the north and north-west. The snow drives incessantly, the sea still high. How the boat keeps up is a wonder." A little later I get this note, showing that even under these uncomfortable circumstances the eye of the observer was not closed:

"Several times during the day I noticed a very remarkable appearance in the sky, as the wind brought up the snowstorms. It appeared as if laths of wood were irregularly distributed over the sky, even to the zenith, wherever the nimbus clouds of the snowstorm covered it; and on

the northern horizon appeared three poles, exactly resembling the three bare masts of a ship with the hull hidden by the high waves. They were white, and at equal distances from each other. The 'laths' were also white, and appeared straight, and the edges ran parallel to each other. They were all of a uniform breadth."

Well, to cut a somewhat long story short, the gale did not lull until the evening of the third day, by which time the *Mary Harmsworth* had been blown about 50 miles off the land in a south-easterly direction. Then, fortunately, a change in the direction of the wind to the eastward enabled them to run back to land under double reefs, travelling about 8 knots an hour, until they once again safely made Cape Grant.

Mr. Jackson notes down in his journal, "Since leaving Cape Neale, three days ago, no one has had any sleep or eaten anything but biscuits, except Child and I, who had a raw dovekie each. The last night was even colder than those which had gone before. The snow and sleet continued, and we were tired and hungry; but sleeping was out of the question, as the boat had to be constantly bailed, and getting at the food was too great a business. Thus we rode out the night, expecting at every moment to go down, so high had the sea become, and so much less buoyant our boat. Every one was more or less cheerful, though. All my men have behaved extremely well, and if we had gone to the bottom they would have done so as becomes men."

The camp at Cape Grant, rough though it was, appears to have been a luxury after the cramped quarters in the boat, but there was plenty of work to do. Twice had the boat been stove in by heavy blocks of ice, and she required repairing in several directions. Moreover, before she was ready to start, another heavy gale sprang up and lasted for six days, leaving the sea strewn with fairly heavy ice and unmistakably in its early winter coat. Jackson consequently determined to return to Elmwood while he could. So on August 5 he left Cape Grant, and after visiting Cape Stephen, Bell and Mabel island, and the intermediate coasts, he regained Elmwood, at Cape Flora, on August 12. "We only got back," he writes, "in the nick of time, for the following day the sea became packed with ice, and it would have been extremely difficult, if not impossible, to cross the intervening water."

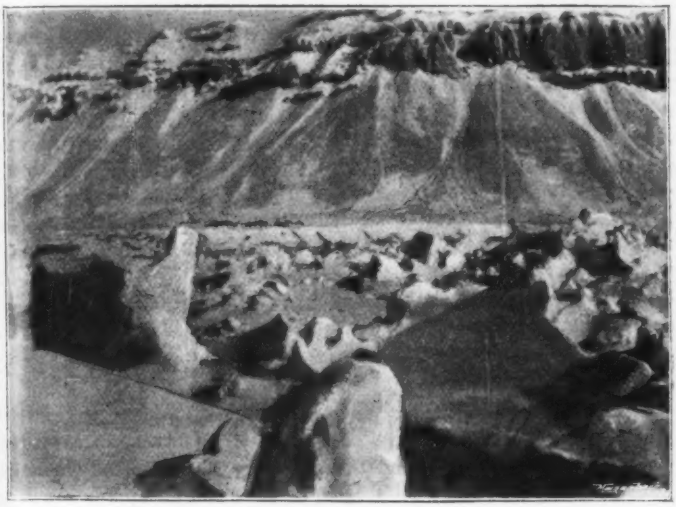
Taking this boat journey in review, I may first point out that Jackson's observations during its progress confirmed him in the opinion that June and July are better months for navigating in Franz Josef Land waters than August and September. The influence of the wind, he incidentally points out, is noteworthy in the fact that for two years he had found the ice packed against the land while the sea was open, in June and July.

The next noteworthy feature is the fact that for the first time those capes and that coast which were seen by Mr. Leigh Smith from the *Eira* in 1880 and 1881—in some cases at a considerable distance and under

the disadvantageous circumstances of mist and fog—were actually reached and ascended; their position was for the first time accurately laid down after a series of careful observations; and collections made which, when worked out, cannot fail to decisively establish the geology and natural history of a region never previously visited.

But there is yet another point in connection with this boat journey. Jackson has advanced Franz Josef Land a considerable distance westward of the previously known limit; and in doing this, he has, I contend, rediscovered and at last attained the long lost and most mysterious Gilies Land.

It was in 1707 that Captain Cornelis Gilies, a Dutch navigator



THE ICE OFF ELMWOOD, CAPE FLORA.

sailed eastward of the Seven Islands for some leagues. He then altered his course to south-east and south, and when in lat. 80° N., he saw very high land about 25 miles—old Dutch miles, one to four English geographical miles—to the east from North-East Land. This land has since that time been known as Gilies Land. Many navigators have tried to reach it and failed; only two, indeed, have been fortunate enough to sight it. Captain Carlsen—memorable for having been the circumnavigator of Spitzbergen and Novaia Zemlia—sighted Gilies Land on August 16, 1863, in the brig the *Jan Mayen;* and Captain Tobiesen, when in command of the schooner *Æolus*, sighted Gilies Land on August 7, 1864. This land was seen by Captain Carlsen when sailing down the east coast of North-East Land; by Captain Tobiesen when he was in the

position of 12″ N. by W. of the eastern point of North-East Land. From that point Gilies Land bore S.E. by S. The observation of Captain Tobiesen is the more important because he continued to see the land during the two succeeding days.

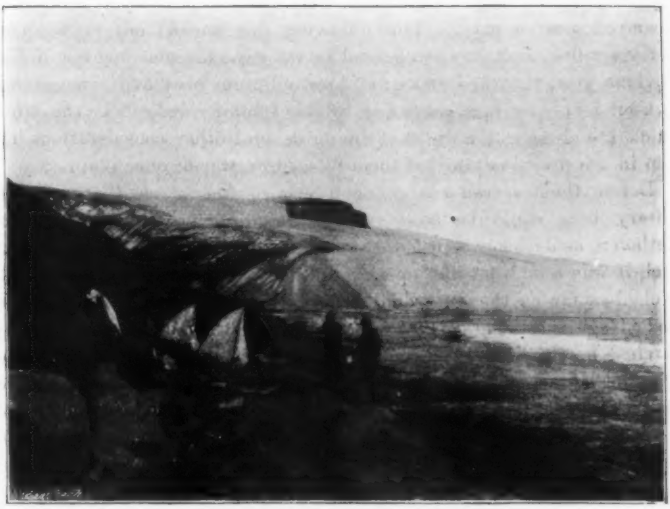
Now all the three navigators who have sighted Gilies Land closely agree as to its position. However far it may extend north and south, it is quite clear that the parallel of 80° N. lat. runs through it. It is true that you will find it in your maps to-day a degree and a half further north, but that seems to be mainly due to the waywardness of a German geographer and the complaisance of those English cartographers who believe in maps made in Germany—though not, I may add, without reasonable grounds. On this question of Gilies Land, however, the Germans have not the shadow of any evidence in their favour. It will be sufficient, I think, for English geographers if I cite the opinion of Sir Clements Markham—for many years and still our highest authority on early Arctic voyages, as well as in other departments of historical geography. In his valuable summary, 'The Threshold of the Unknown Region,' which has gone through many editions, he distinctly states that the narrative of Gilies' voyage, as given by Daines Barrington, "exactly agrees with Van Keulen's chart" and also "with the bearings taken by Tobiesen in 1864. But," continues Sir Clements, "Dr. Petermann has written rather disparagingly of Van Keulen's chart, and has altered the position of Gilies Land from 80° to 81° 30′, referring to Barrington as his authority. Mr. Foster, who was one of the lieutenants in Parry's expedition of 1827, gives a very different estimate of the value of Van Keulen's work. He says, 'We recognized distinctly almost every feature of the lands delineated in the old Dutch chart.'"

That being so, I am content to consider Gilies Land as moved back again to the old latitude of 80° N. Now, Mr. Jackson, in extending the coast of Franz Josef Land to Cape Mary Harmsworth, which lies in 80° 30′ N. lat. and 42° 30′ E. long., comes (as he approaches from the east) within—putting it roughly, of course—some 30 miles of the western coast of Gilies Land; of that coast, in fact, which was seen by Gilies. No land was seen by Mr. Jackson to the westward or south of westward, and it seems to me perfectly clear that, in discovering that grand cape Mary Harmsworth, Mr. Jackson has also been the first to approach the land which has so long been a matter of debate and speculation. For Mary Harmsworth is, in my opinion, the southern point of the long-sought Gilies Land.

The winter of 1895–96 was passed at Elmwood, the headquarters of the expedition—so comfortable and commodious with its long line of huts that we might call it a village, if there were only a few more villagers. At any rate, it is the most northerly British settlement in the world. And early in the present year, preparations were begun for another journey northward, but the conditions of the late winter and

spring climate were so remarkable as to deserve a passing notice, which I will take from Mr. Jackson's journal.

"Since the middle of February," he writes, "we have had weather I believe to be unprecedented in this latitude. The thermometers during this time have been hovering close up in the neighbourhood of freezing-point, and we have had in consequence great quantities of snow, which lies deep and wet on the floes. On March 5 the air was as balmy as June. There have been no cold winds to harden the snow on the floes, and it is almost impossible to drag the sledges across it. Our furs get



CAMP AT CAPE GRANT, JULY 30, 1895.

dripping wet, and when the inevitable fall in temperature comes, they are frozen hard as steel."

But this sort of weather is frequently broken, even in the summer, by violent gales, accompanied by low temperatures, and "the New Year," writes Mr. Jackson, "opened fire with a gale of wind, accompanied by 73° of frost (Fahr.). A week later we had a hurricane for four days, the temperature falling to $80\frac{1}{2}°$ of frost."

It was on March 18 of this year that a start was made for the journey towards the north. The party consisted of three—Jackson, Armitage, and the sailor Blomvist. They had with them seven 9 foot 6 inch sledges, carrying rather over 2000 lbs. of stores. For draught purposes there were one pony and sixteen dogs. Six weeks' provisions were taken, the pony being rationed at 10 lbs. a day (6 lbs. dried vegetables and 4 lbs. oats) for that time, while the dogs had tinned beef at 1 lb. a dog for twenty-four days. Mr. Jackson relied on getting bear's flesh to eke out this ration.

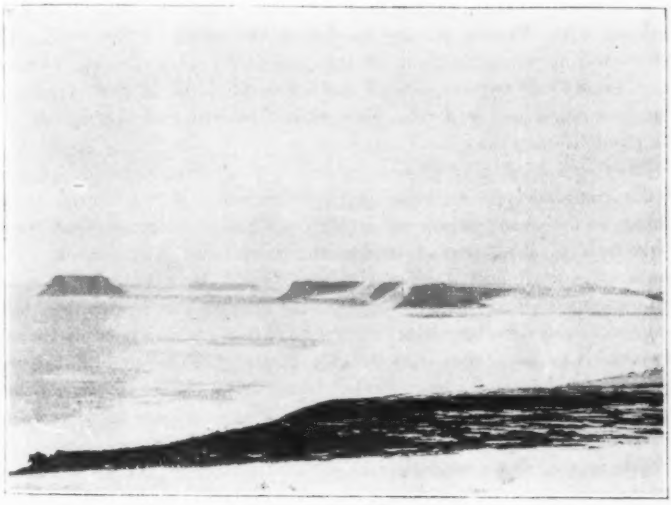
The mild weather, which Mr. Jackson attributed in the early spring to the presence of a considerable body of open water to the north, broke for a time. When they started, the temperature had fallen to −5° Fahr., and by the time they camped that night it had fallen 20° lower. The result was that they marched rapidly, and at the end of seven days were near the 81st parallel. On striking camp on March 26, they proceeded for about half a mile in a dense snowstorm, and then found themselves at the edge of the floe, and confronted by a stretch of thin bay ice, and beyond that again open water. Turning to the eastward and following the edge of the pack, they came to land by evening, and encamped near a cape. The following day turned out to be most gloriously fine, and they recognized in the cape the place where, in the previous year, they had deposited an aluminium boat and some stores. Jackson and Armitage ascended to the summit, and then the truth which the climate, the flight of the birds, and other considerations had even in the previous year led them to suspect, was at once plain.

Before them spread a large open sea, so free of ice that only one solitary berg could be seen in it. Standing on this cape—Cape Richthofen, as Jackson called it—at an elevation of 700 feet above sea-level, it was seen that the open water was of considerable extent. It reached as far as the eye could follow it to the north; to the west it washed against the glacial faces of the land they discovered as they marched north through the wide sound which Jackson has named the British Channel; to the north-west lay land, apparently two islands, one small and the other of some extent; between north-west and north there was no land to be seen, and the horizon was clear and sharp; north lay an island which Mr. Jackson thought might prove to be the King Oscar Land of Payer. Between north and north-east the distant view was veiled by the land near at hand, by whose shores Mr. Jackson had marched half a degree farther north in 1895; but in that direction, and pointing towards Petermann Land, on the very existence of which some doubt has been thrown, there extended a dark water-sky, clearly showing that this sea lay to the north of the chain of islands which now alone remains of the continental mass of Zichy Land.

"I took bearings," writes Mr. Jackson, "and made sketches of the various coast-lines in sight, and took a number of negatives of the open water, which have come out well. I longed to be able to dump the *Windward* into this water, for here, at any rate, was a clear run north for a considerable distance. A boat would have been useless, as she would at this season of the year very soon have become frozen into the bay ice, through which it would have been impossible to row, and over which we could not walk."

This great expanse of water Mr. Jackson named Queen Victoria Sea. It is especially noteworthy that for two years in succession it was encountered, though in the former year thick fog and snow had obscured

the sea, and only revealed the fact of a long stretch of bay ice. It is also to be noticed that Jackson then independently established the fact he had for some time been compelled to suspect—namely, that the main group of the Franz Josef Land archipelago did not extend far northwards, and that a considerable quantity of water, more or less always open, lay to its immediate north. Subsequently, and also independently, the drift of the *Fram* led her in the pack round the north part of this sea—a conclusive proof that Jackson was right in believing that he had practically reached the northern limit of any land mass. He does not



BELL ISLAND, "'TWEEN ROCKS," CAPE STEPHEN, AND MABEL ISLAND.

yet know, of course, that the *Fram* has done this; but in the letters he has sent home to Mr. Harmsworth he is emphatic in his statement that no land lies to the north for a very considerable distance.

I cannot now ask you to follow me in the tortuous windings and counter-marchings of his explorations of the islands lying between this point and Hooker island, diverging as they do east and west on occasion considerably. It will be sufficient, perhaps, if I refer you to the map, and ask you to compare it with those published previously to last year. You will notice at once how great a change has come over the face of that part of the world; how sea has flowed in where lofty masses of land once stood; and how islands, large and important, have risen from the depths of the sea. And you will also notice how the great white spaces of the absolutely unknown have been filled up and plotted out into various geographical forms of land and water; and how names familiar

to many of us have appeared in that remote region of the earth. There are many, but perhaps it will be sufficient if I indicate a few. In the northward track there lie Clements Markham bay, Frithjof Nansen island, Cape M'Clintock, Cape Albert Markham, Allen Young sound, Scott Keltie islands, Capes Sybil Montefiore, Alice Armitage, and Fisher, Robert Peel sound; and in the west we find Peary glacier, Weyprecht bay, Nordenskiold bay; and, finally, at the present western *Ultima Thule* of the archipelago, and on, as I believe, the mysterious Gilies Land, Cape Mary Harmsworth.

I must now pass on to one of the most dramatic incidents that has ever occurred in the whole history of Arctic discovery—the meeting of Jackson with Nansen on the ice-floe to the south of Elmwood. But before telling you something of this wonderful story, I ought to touch very briefly on two aspects of the scientific work of the expedition. The first must deal with the glaciers and ice-cap, and the second with the plant life of Franz Josef Land.

With regard to the glaciers, there are very few of large extent or of the common type. The ice-cap which crowns nearly all the islands seldom descends to the sea, and in only one case does Mr. Jackson record a glacier projecting with a broad tongue well out into the sea. This was on the south-east coast of Hooker island. It is this glacier which launches flat-topped bergs of considerable breadth and length, but lofty bergs have not once been seen, neither have any glaciers been met which are capable of launching lofty bergs. The highest bergs do not exceed 75 feet, and these are rare. Really large bergs—such as Mr. Jackson mentions having seen off the coast of Greenland—he declares to be myths in the Franz Josef Land region.

The ice-cap and inland glaciers show little sign of movement, though observations and measurements have been continuously made. When the movement occurs, it is always slow, and crevasses are few. The angle of their slope is often excessive—far greater, as a rule, than in Greenland, where an incline so little as 2° is not uncommon. In Franz Josef Land a slope of 15° is not rare, but the rule is that the less steep the slope the more frequent are the crevasses. The glaciers are almost invariably smooth in surface, and Mr. Jackson states that he only knows of one exception, where the glacier is very rough and much crevassed. This occurs near the south-east point of Frithjof Nansen island. It is caused, Mr. Jackson thinks, by the ice being forced down from the high land behind into a very shallow bay, where the bergs become detached but remain grounded and unlaunched. They are pressed severely by the oncoming ice, while they, in turn, return the pressure and thus cause excessive crumpling. On the other hand, the pressure of the glacier slowly rolls the bergs over and over before it, causing them to break up, and at the same time leaving them covered with mud churned up from the bed of the shallow sea.

The members of this Society will remember the remarkable glacier-faces which Peary has found and photographed in North-West Greenland, showing many and minute layers or laminations, and exhibiting regular stratification, with occasional folding and false bedding. The photographs of these extraordinary developments were exhibited at the Geographical Congress, and are, I believe, preserved in the map-room of this Society. They have been considered unique. It will interest the Society to know that similar developments have been discovered in Franz Josef Land, and photographs made of them.

Speaking of the ice-cap, which varies from a few to a thousand feet in thickness, Mr. Jackson compares its character in many islands to the

MEETING OF JACKSON AND NANSEN, JUNE 17, 1896.

descriptions given of Antarctic ice, and he instances Bruce island as a good example. The whole island is capped with ice, and the steep coast is nothing else than the face of the glacier. Rocks only appear, jutting out at intervals, on the level of the shore-line. The country west of Cambridge bay is of the same character. On the other hand, Mary Elizabeth island, Scott Keltie island, and one or two plateaux have been found quite free from ice.

The rotten condition of the ice in the sounds and straits between the islands is attributed by Mr. Jackson to the great amount of open water, both north and south; to the rapid currents, to the heavy falls of snow, and boisterous winds. These break the ice up, even in mid-winter, and the great mass of snow weighs down the rotten ice and forces the water up between the cracks. Hence the soft slushy

surface even in the early days of spring. Last year, at the Geographical Congress, Admiral Markham correctly surmised that this rotten ice was likely to prove a great obstacle to exploration in summer; but he will be surprised, I think, to hear that this condition attaches to exploration even from the dark days of the long winter. Indeed, I think that Admiral Markham, who has long made Franz Josef Land a special study, and whose weight as an Arctic authority is in no need of appraisement by me, will have a good deal to say of the series of surprises which Mr. Jackson has given us in the last two years.

For, as a matter of fact, Jackson's work has completely revolutionized our ideas and maps of Franz Josef Land. He has proved that it is persistently an archipelago—a region of islands and straits and seas; and in doing this he has been forced to ignore or condemn the statements of Payer, whose opportunities regarding the central and western area were, I would hasten to add, not those which Jackson has the good fortune to possess. Misled by Payer, our Arctic veterans—Sir Erasmus Ommanney, Sir Leopold M'Clintock, and Sir George Nares—will be inclined, I suspect, to withdraw their support from Franz Josef Land as a point of departure for higher latitudes, and be content to regard it as sufficiently and supremely interesting in itself as the most northerly known land in the eastern half of the Polar basin.

In touching upon the botanical work of the expedition, I prefer to submit to you a brief and interim report which Mr. Harry Fisher, our botanist, who has returned home after practically exhausting the flora of the archipelago, has been good enough to draw up. I will merely preface his remarks by quoting a portion of his leader's appreciation of Mr. Fisher. "He has done," writes Mr. Jackson, "most valuable work for the expedition, and has added immensely to its scientific results." *

As to the geology, several large cases of rocks have come back, and when they have been properly examined, I shall hope to present a report to the Society for publication in the *Journal*. With regard to meteorological, magnetic, and other observations, I may say that for two years, winter and summer, night and day, readings have been taken every two hours.

Studies of the animal life of Franz Josef Land have been steadily maintained. Many photographs have been secured of mammals and birds in their native state, and illustrative of their habits. In photographing bears, Mr. Jackson would go out on the floes with gun and camera, and first attract attention by waving his rifle and making striking gesticulations. Impelled by a somewhat natural curiosity, the bear would approach—stalking the stalker—while Jackson would stoop down and take snapshots with his camera until the object was within ten or a dozen paces. Then he would take another sort of shot.

* This report is appended to Mr. Montefiore Brice's paper.

Though angling with line and hook was tried, it proved unsuccessful; and in order to obtain specimens of fish, it became necessary to stand on the shore and wait for the birds that came flying in from the distant open water with fish in their mouths. These birds were promptly shot, and came tumbling down with the fish still in their grip. This is an instance, I fear, of highway robbery with violence to the person, but science condones much.

And now I come to the story of how the members of the expedition saw Nansen travelling on the ice-floe to the south of Elmwood, making in the direction of Spitzbergen; of how they went out and met him on the ice; how they brought him and Johannesen back to Elmwood, and there entertained them for six weeks; and, finally, of how Nansen returned on the *Windward* under the able command of Captain Brown, and arrived safely at Vardö just a week before the *Fram* issued from her long drift of three years' duration.

It happened that on June 17 of this year, just after the members of the expedition had finished dinner, Mr. Armitage, who had been taking down some readings in the observatory, put his head in at the door and called out, "How many of you are here? I see a man on the ice-floe."

They counted round, and found that all were present. It was evidently a new-comer that was near them. Mr. Jackson at once jumped up, saying, "Whoever it is, I am off;" and he ran out of the house, while the others seized telescopes and binoculars and prepared to follow. The idea of its being Nansen, says Mr. Harry Fisher, did not occur to them until after the lapse of about twenty minutes. He and Mr. Armitage both hazarded the opinion that the distant stranger might be Nansen, and as they watched they saw Jackson and the stranger approaching each other, waving to each other as they walked; and then, as they stood talking with excitement, apparent even at that distance, the watching group exclaimed, "It must be Nansen!"

And Jackson himself writes in his letter to Mr. Harmsworth—

"I at once started off, and saw a man on the pack-ice to the south-east of Cape Flora, and a second person farther off. I fired several shots to attract their attention, and after about an hour's walk we came up to one another. As the man was on 'ski,' I concluded he was a Norwegian, and imagined him to be a walrus-hunter who had come to grief somehow. On approaching nearer, I noticed that he was as black as a stoker from head to foot. His clothes were covered with grease. It was evident that he had been in very rough circumstances for some time past. I walked up to him, and we shook hands warmly, and the following conversation ensued:—

"Jackson: I'm awfully glad to see you.

"Nansen: So am I to see you.

"Jackson: Have you a ship here?

"Nansen: No, my ship is not here.

"Jackson: How many are there of you?

"Nansen: I have one companion in the distance there.

"During this time I had been steadily looking into his face, and in spite of his long black hair and smoke-black skin, thought that he was Nansen, whom I had known in London.

"So I exclaimed, 'Aren't you Nansen?'

"'Yes,' he replied, 'I am Nansen.'

"'By Jove,' I responded, 'I really am awfully glad to see you.' Then we shook hands again still more heartily. 'Thank you very much,' said Nansen; 'it is very kind of you.'

"I then asked him where he left the *Fram*, and he told me that, after drifting for two years, he left the *Fram* in 84° N. lat., and managed to reach the very high latitude of 86° 14′, when he turned back and came on here. After some more talk, we again shook hands, and I told him how intensely pleased I was to be the first person to congratulate him on his magnificent success. We then turned and walked towards Elmwood, and, meeting the rest of my colleagues, I introduced them to Nansen, calling for three cheers for him, which were most heartily given. Nansen appeared very pleased. Again and again he repeated, 'This is splendid.'"

Mr. Jackson then despatched Messrs. Fisher and Child to go to Johannesen and to help him bring in the kayaks and sledges.

Mr. Fisher gives the following account of the meeting with Johannesen:—

"After going for a short distance, we suddenly rounded an ice-hummock and saw Johannesen, who had the kayaks with him. Before coming up to the lieutenant, we saw what looked like a black flag on a pole. On approaching nearer we found it to be a shirt, evidently blackened by many months of blubber smoke. Johannesen himself, like his chief, was black from the same cause. His appearance was rendered more grotesque by two white patches under his eyes. We had great difficulty in making Johannesen understand us, as he knew no English. We greeted one another by waving our caps and by heartily shaking hands. We gave Johannesen a pipe and tobacco, and he had the first smoke since he had left the *Fram*. We at once took charge of the kayaks and the other impedimenta, refusing to allow Johannesen to carry anything, and we started off to follow Nansen and Jackson to Elmwood."

I will conclude this part of the story of the last year, which he writes to Mr. Harmsworth, with Jackson's account of the first evening at Elmwood.

"When we reached our headquarters it was midnight, which up here is as light as noon. We began to prepare a good meal for our guests, who, meanwhile, had a much-needed hot bath and an entire change of clothes. After Nansen and his companions had had a shave and hair cut—our photographer operating—none would have recognized them as the dishevelled, smoke-blacked individuals we had met on the ice. Our dinner, thanks to your good care of us, was, I can assure you, a great success, for we managed, to Nansen's astonishment, to add to roast loom, green peas, and other vegetables, jam tart, cheese, and preserved fruits, all washed down by port, sherry, and whisky. I can leave it to you to imagine how hearty were the toasts that followed. Curiously enough," continues Mr. Jackson, "the day before we met Nansen he had fancied he heard some shots and the barking of dogs. He put this down, however, to the noise made by ice-crashes, but, as a matter of fact, I had been shooting in the neighbourhood. I have done

my utmost to make him comfortable, and to give him a good time after his rough experiences. He has made a most extraordinary journey, which for daring is, in my opinion, absolutely unequalled in the annals of discovery, either in the Arctic or other regions. But he will tell his own tale."

What that tale is you have already partly heard. How the *Fram* has found that the deep sea which we knew existed to the north of Spitzbergen, runs round the north of Franz Josef Land and many degrees to the eastward; how in her long drift north of the 80th parallel no land was seen; how the warm water of the Gulf Stream, which we find far below the cold water of the sea north of Spitzbergen, also penetrates far into the eastern half of the Polar basin; all this, however, you have heard, and more will you hear. But I am only concerned now with one or two remarks which Jackson makes in his letters in connection with Nansen's sojourn at Elmwood.

And one is this: "Payer's map, being so utterly wrong, had completely fogged Nansen; and at his winter hut, some miles south of our camp, in the spring of 1895, he believed himself near Cape Lofley, and that the land to the westward, which we had discovered, was Spitzbergen. He came right down in our old route, and, finding himself on the 80th parallel, was pushing westward for Spitzbergen. This spring I was close to him and his winter hut, and, had I suspected his presence, could have crossed over to the place. The letters I had for him I always carried with me on these journeys."

It will be remembered that Nansen's chronometer watches had run down, and that he could not be certain of his longitude. Consequently we find Jackson writing, "I have given him tracings of my map. Armitage and I have given him all the help we could with his map, and he has filled it in with our tracings. I had not wished to publish any map yet, for I hope for further opportunities of making it even more accurate than I believe it to be already; but now that I have given the map to Nansen, it is right that I should also send it back to you. I have also offered him the naming of the country in the neighbourhood of his winter quarters, as I think it rough on him to be unable to name anything in the neighbourhood where he passed a winter under such conditions, and under the impression, too, that he had discovered that country—until, indeed, he saw my map of it made last autumn. He has made an extraordinary journey, but has very little of his own to name. He has some hesitation in accepting my offer, but I know he would like to, and I don't see why he should not, as it only rests between himself and me."

I really cannot refrain from just saying that, in my opinion, for single-mindedness, generosity, and an entire absence of anything approaching a petty sense of rivalry, those few words of my absent friend and the acts they record would be difficult to beat in the annals of exploration. Yet hardly less generous was the responsive act of

Nansen, whose first use of the privilege he received was to give to the island on which he wintered the name of Frederick Jackson.

One word more, and I have done. Mr. Harmsworth is determined, as you know, to maintain the British flag in the Arctic regions, and intends to go on and to go forward with the work he has begun. The journey of Nansen—memorable as it must remain—still leaves immense areas absolutely unknown. The drift of the *Fram*—full of marvel though it be—has only extended our knowledge a few degrees in one direction. But there are more degrees and many directions. The unknown geography of the North Polar world still invites attack, and still holds out the promise of a crowning reward. There is, in short, work as useful as any yet achieved still to be done, and to be done, I hope, greatly to our national credit; when we shall work, too, in the hope of meeting with that most promising of all geographical discoveries —the discovery of land in the heart of the Polar area. The scientific world, and most of all the Royal Geographical Society, cannot afford to pause, and will not be content until we have discovered, explored, and mapped what is still unknown—the greater portion and the most remote region of the North Polar world.

SOME REMARKS ON THE FLORA OF FRANZ JOSEF ARCHIPELAGO.

NOTE.—In this case I have not considered priority in names of importance.

PHÆNOGAMIA.

THE chief features of this remarkably insular flora are the absence of willows, sedges, the heath family, the mountain sorrel, the dandelion, the louseworts, and a few other species which in other Arctic regions attain a latitude as high as Franz Josef Archipelago.

The presence of the rare and beautiful grass (*Pleuropogon Sabinii*, Br.) is quite as interesting as the absence of those plants above mentioned. This remarkable species was discovered by Captain (afterwards Sir Edward) Sabine at the winter quarters in the south of Melville island, lat. 74° 47′ N., long. 110° 48′ W., in 1819. Afterwards it was found in a few places in a south-easterly direction. Then Baer found it in Novaia Zemlia. Then in 1878 it was found in Actinia bay, Taimur island, by the Vega Expedition,* 76° 15′. Now that we have it from Franz Josef archipelago, four degrees further north† than previous records, the distribution, which was always interesting, is now extremely so. We know now that there is a deep sea between Franz Josef Archipelago and the Polar American Islands. It seems probable that the migration is by way of Siberia, and not across the pole. There is, however, nearly a hemisphere (155°) without a record. It should be carefully looked for between Taimur and Behring's Straits. You will notice that it is unknown from Grinnell Land, Greenland, and Spitsbergen, and between Taimur Island and Melville Island.

Most of the islands are completely ice capped, but on the southern side of a few there are bold headlands of dolerite, which have an average height of 1000 feet,

* Kjellman. † 80° 3′ N.

exclusive of the ice-cap. The upper half of these headlands is precipitous rock, the lower portion being composed of loose *débris*, in some cases down to the edge of the sea. In others we have extensive *débris* on the western side, almost bare of any vegetation; the southern side being grassy and mossy, the eastern side being mossy towards the south and bare towards the north. The Phanerogams are almost confined to the south and south-east side of these headlands. At the base of the talus there is usually a raised beach, sometimes 400 yards wide, as on Cape Flora, but wanting in others, as on the south-east side of Cape Grant. On the west side of Cape Grant there are four raised beaches covered with moss (a doubtful fifth, probably belonging to the same age as the fourth). On Cape Stephen there are three. On Cape Flora there are three. On all of these there is a considerable amount of vegetation, chiefly mosses. In the wettest places they form lovely carpets of crimson, green, and gold.

There are similar raised beaches on other capes, varying in number, however. There is a fine corrie on Cape Stephen, and a smaller one on Cape Grant, but, as these are both on the western side, the flora is almost confined to a few lichens. There is a beautiful corrie on Mabel island facing south. Here we have an improvement in the vegetation when compared with any other spot, excepting the fine beach on the south-eastern side of Cape Stephen. A corrie is a Scotch name for a hollow in a mountain. In the highlands we look in the corries for the more interesting plants. They are the sources of the streams and rills which trickle down the mountain-side.'

In Franz Josef archipelago corries are very bare of vegetation, probably because they are all on the colder side of the headlands. This remark cannot be applied to the one on Mabel island, however. In the height of the summer these corries had about an inch of water in the middle of a patch of mud and grit—I mean the water was an inch deep. This was surrounded by barren *débris*.

Below the raised beaches already named, we have the sea-beach of the present day, usually devoid of vegetation; and even when the plants descend to the very edge of the sea, they are of no interest. Unlike other Arctic regions, we have here no maritime plants.

There is a cold current running along the southern shores of this archipelago from east to west (approximately), the ice clinging to the shore throughout the summer in many instances. When the ice does leave the shore, it is usually so late in the season that vegetation has no chance of existing, if it ever succeeded in establishing itself. I have only seen two spots where maritime plants might be expected, and these were separated from the sea by ice the whole time, excepting one month in 1895. Then the abundance of fresh water which is discharged into the sea at these two places named, renders the water too free of saline matter to encourage the growth of maritime plants, supposing they have ever existed there during similar climates to the present.

On the south-eastern side of Cape Gertrude there is a flat, sandy, marshy-looking beach only a few feet above the sea. I saw this first in September, 1894. It was then as hard as a road, and there was a little snow on it. It seemed to me a very promising place, so the next summer I went to look for those damp-loving plants which are well known to grow in latitudes quite as high as this. I was there on Cape Gertrude eight days, so that I had abundance of time to satisfy myself as to the vegetable life. It must be difficult for you to imagine a more desolate waste than this; not a single flowering plant—not a leaf of one—and this on the warmest side of the cape. On the south-western side of this cape I found a small flora, and on the south side, on raised beaches, there are small but beautiful patches of the purple saxifrage.

You will have come to the conclusion by this time that Franz Josef Archipelago is not a paradise for the lovers of flowers; but we must not take too gloomy a view of this forbidding-looking group of islands. In support of this statement, I must ask you to attend to the cryptogamic flora referred to later in this paper. Before passing to that, I must request you to consider a few remarks on the Phænogamia.

There are fourteen common Arctic plants, which find a home here in every possible place for a plant to grow, some of them of considerable beauty when compared with their stern surroundings; others of them do not flourish, but merely exist. Those plants which may be said to succeed the best here are well known amongst the most Arctic species. I may mention them, as there are not many: *Papaver nudicaule* (yellow and white poppy), *Cardamine bellidifolia*, *Draba alpina*, *Cochlearia fenestrata*, *Cerastium alpinum*, *Saxifraga oppositifolia*, *Alopecurus alpinus*, and *Phippsia algida*.

Now I will mention the few plants which are scarce here: *Pleuropogon Sabinii*, Br., in one pool only. *Sagina Linnæi*, Presl., on Cape Neale only. *Arenaria sulcata*, Schlecht, on three capes, but very scarce indeed. *Saxifraga stellaris*, L. (var. *comosa* = *foliosa*). This is small, but looks like existing as long as most of the phænogams in the three spots where it grows. This is a high latitude for the last.

Cryptogamia.

There are no vascular cryptogams. There are as many musci as we can expect, but very few species are fertile. There are lovely carpets of brilliant crimson, yellow, green, and golden mosses on the wet level raised beaches. Hepaticæ are poorly represented; the only species—*Marchantia polymorpha*—although barren, is luxuriant from near sea-level to 500 feet on Capes Flora and Grant, but not elsewhere. The absence of all other Hepaticæ is unaccountable. Marine algæ are extremely scarce, and very difficult to obtain. I believe I have brought everything that it was possible to procure. The scarcity of open water makes it unusually difficult to procure these forms.

Fresh-water algæ are more plentiful. I devoted much time and labour in collecting, examining, and preserving every species.

Lichens.

These are fairly well represented, the most notable absentee being *Dactylina arctica*.

It is unnecessary to mention any but the most characteristic species. *Placodium elegans* is the one which most attracts the eye, and which gives a warm orange tint to the landscape in some places. Some boulders are almost covered with it, from the present sea-shore up to 600 feet. Then the cliffs are in many places decorated up to about 1000 feet. Snow melts very soon on boulders when this lichen is present in sunny places.

The next most characteristic species is *Neuropogon melaxanthus*, a pretty and interesting plant. I never saw this on rocks *in situ*. On loose boulders it is abundant up to 900 feet. This plant has a very wide distribution, although it is not found in all Arctic regions.

The *Gyrophora* group, known also as *Umbilicaria*, are here in great profusion, but many of the forms which are known in the Arctic do not occur here. One of the species is represented by a handsome variety (*G. Delisei*). These plants also ascend to 900 feet.

Thamnolia vermicularis, Sw., sometimes called macaroni lichen, is conspicuous at all elevations. There are large patches near sea-level, but the finest examples are in damp hollows on the talus at 500 feet. It ascends to 900 feet, but is small

and much scarcer. At this elevation it is conspicuous owing to the great paucity of other plants, the only flowering plant which ascends to that height being *Phippsia algida*, a common Arctic grass. This does not flower, however, above 600 feet. Small tufts of leaves nearly an inch long are found at 900 feet in one place.

Lecidea geographica is the only other lichen which is conspicuous at 900 feet.

Peltigera aphthosa is in profusion at low elevation. This is a very conspicuous plant, having the upper surface of the thallus an apple-green colour. There is a handsome variety of this, having its upper parts a fine bronzy green, less easily fractured than the common form. I have not seen this form from any other region. There are other species of this genus, but they are neither conspicuous nor frequent.

I only found the pretty *Solornia crocea* in one spot. It is very small there.

It is sometimes difficult to obtain specimens of the saxicolous lichens, some of which only grow on round smooth boulders of dolerite. I did, however, bring back specimens of them all.

Fungi are fairly well represented by *Agarici* and *Auricularini*, but microscopic parasitic forms are very rare. I never lost an opportunity to look for these, but rarely succeeded in finding any.

The Protophyta are the most numerous forms. Some mossy pools abound with small organisms of this class, including "red snow," which is very abundant in many places. Of the microscopic forms of this sub-division we now have a very interesting collection of the most Arctic forms. I collected examples in some quantity from many places. Diatoms, though very abundant, are not represented by a great variety of species. Desmids are remarkably scarce.

I subjoin a diagrammatic summary of the results as far as they have been worked out—

RECORDS FOR FRANZ JOSEF ARCHIPELAGO.

	Phænogams.	Mosses.	Lichens.	Fungi.	Diatoms.	Protophyta other than Diatoms, and fresh-water algæ, etc.	Marine algæ.
Payer	5	0	9	0	0	1	0
Leigh Smith	12	0	1	0	0	0	0
Jackson-Harmsworth Polar Expedition	27	25	70	10	35 genera	210	10

N.B.—Everything was "dead" when Payer made his collection. Mr. Leigh Smith did not pretend to systematically collect.

H. FISHER.

ZOOLOGY.

Mr. Fisher also gives me the following interesting notes on one or two of the zoological results :—

I have brought many collections of microscopic material for cultivation and further examination. These contain Infusoria, Flagellata, Amœba, etc. These are being worked out.

Dredging in the sea was only possible on a few occasions, but all the specimens dredged were preserved in spirit.

Fishing with the line met with no success, but many specimens were taken from birds, and are preserved and brought back.

NOTE ON THE INSECT FAUNA AND SPIDERS OF FRANZ JOSEF ARCHIPELAGO.

The insects of Franz Josef Archipelago are represented by very few families and species. The absence of all Lepidoptera is not remarkable; on the other hand, no forms are here which were not expected. Hymenoptera are absent. Coleoptera are represented by one species, and that is probably introduced with wood to Cape Flora, as I only have two specimens, both found on the log house (one was just outside).

Diptera are represented by less than a dozen species. One or two species of snow-flea.

ARACHNIDÆ.

There are three spiders and about four Acari.

I have preserved specimens of every insect and spider, and made drawings of them and larvæ. I am now working at them.

The PRESIDENT: We have the pleasure of welcoming here this evening Mr. Harry Fisher, of whom you have heard so much in Mr. Montefiore Brice's paper. He has already passed two winters with Mr. Jackson, and is one of those who formed the crew of that boat in the perilous voyage to Cape Mary Harmsworth. He has also done much valuable botanical work. I am sure we all give him a hearty welcome on his return home. I hope he will address a few words to the meeting on the subject of his collection before we adjourn.

Mr. FISHER: As it is getting so late you will please excuse me, as there are many here who would like to say a few words upon the subject.

Admiral MARKHAM: I feel somewhat inclined to imitate the example of the last speaker; nevertheless, sir, at your call I will say a few words. I am quite sure that I shall only be expressing the feelings of the Fellows of the Royal Geographical Society when I say that we owe a deep debt of gratitude to Mr. Montefiore Brice for the way—or, to quote our President's words just now, the admirable way—in which he has kept us informed of all that has taken place in that far northern settlement of Elmwood since Mr. Jackson left our shores; but, however much we are indebted to Mr. Montefiore Brice, we owe a still deeper debt of gratitude to Mr. Harmsworth, not only for his conception of the enterprise, but also for his munificence in defraying the expenses of an expedition, which has for its objects the exploration of high northern latitudes. We have listened with a very great deal of interest to what Mr. Montefiore Brice has told us this evening, and I, with him, look forward with confidence to the continuation of the good work which I feel sure Mr. Jackson is now doing in Franz Josef Land, and has been doing since the date of the departure of the little *Windward*. When we get all the details of his work to hand, supplemented as these doubtless will be by the account of the discoveries of Dr. Nansen, we ought to have a very tolerable idea of the extent and formation of Franz Josef Land, and the relative conditions of the ice, the sea, and the land in that large archipelago. Our lecturer has this evening very graphically related what he calls the dramatic incident of the meeting of Nansen and Jackson. I do not know—I do not think, that anything of more dramatic interest has ever occurred in the annals of geographical exploration than the meeting of these two explorers on the ice-bound coast of Franz Josef Land. It is, in my opinion, even more interesting than the well-known and almost historical meeting of Dr. Livingstone and Mr. Stanley in the dark continent of Africa, for on that occasion, as we all know, one party was actually in search of the other; but in this instance the explorers met in a practically uninhabited region of the world without having the most remote idea that they were within hundreds of miles of each other. Our best wishes are with Mr. Jackson for a very successful issue to his undertaking. The lecturer has

informed us of the hardships that he and his gallant companions have gone through, and I am sure that we all admire the pluck and the endurance that they have displayed by remaining so long in that inhospitable country solely for the purpose of geographical research.

One word more before I sit down. I have been studying with a very great deal of interest since I came here, the chart placed in our hands by the Royal Geographical Society. I am naturally not a little gratified to find my unworthy name occupying an undeserved place in this map. I find I am surrounded by a goodly company. I see round me the names of other Arctic explorers, and of many eminent geographers, but, I do not know whether it is that age is dimming my eyesight, I fail to see the names of two men who are most intimately associated with the history of Franz Josef Land, except in the little notice at the bottom of the map, which says "that the meridians of longitude are measured from the observations of Payer and Leigh Smith," for it is to the absence of the names of those observers that I allude. I only throw this out as a hint that, when the nomenclature of our new map is being considered, the names of these eminent geographers and discoverers will not be altogether forgotten. I hope Mr. Montefiore Brice will not object to this very mild criticism; neither will he be offended if I correct him in saying that only three expeditions have visited Franz Josef Land. I think he has forgotten the Dutch expedition under De Bruyne, in 1879, which spent four or five days on that continent.*

The PRESIDENT: I think we may look upon this paper, on the second season's work of the Jackson-Harmsworth expedition, as giving us assurance that before long this interesting group of islands will have been completely surveyed. Such a survey will be a most useful and valuable contribution to geography—its value, indeed, can hardly be exaggerated; but, as Mr. Montefiore Brice has said, there is much more to be done, and I look forward, when the exploration of this archipelago is finished, to the hope that other work will be done of still greater importance. Personally, as I do not believe in any land near the Pole, or on this side of it beyond Franz Josef Land, I trust an attempt hereafter will be made to explore another portion of the Arctic regions. I believe there is land, probably in the form of large islands, between Prince Patrick Land and the New Siberia islands. That is a part of the unknown region to which I would venture to draw attention.

Meanwhile our friends are making ready for the third season of exploration, so as to complete the survey of Franz Josef Land. We shall remember them at Christmas-time. We shall remember them when the spring approaches, starting away again to endure the hardship which they now thoroughly understand and do not fear. We shall greet them heartily when they come home to us. Meanwhile it only remains for us this evening to thank their very able expositor, who has so brilliantly, I may say, brought home to us the work of those who are now far away.

In the name of the meeting, I return our most sincere thanks to Mr. Montefiore Brice for his most interesting paper, and for his photographs.

NOTE ON MR. JACKSON'S MAP.—It will be noticed that the longitudes given by Mr. Jackson appear at the top of the map. They are reckoned from the meridian of Cape Flora, which Mr. Jackson has left as 0°. I understand, from Mr. Harry Fisher, the botanist to the expedition, that the mean of a considerable number of observations already taken by Messrs. Jackson and Armitage gives the

* In attempting to correct Mr. Montefiore Brice, I regret to say I was betrayed by a somewhat defective memory, for I find that although the Dutch under De Bruyne were off the coast in 1879, they failed to land on the shores of Franz Josef Land. Mr. Montefiore Brice was, therefore, perfectly correct in his statement that only three expeditions had succeeded in landing on Franz Josef Land.—A. H. M.

longitude of Cape Flora as 49° 47′ 10″ E.; but Mr. Jackson has purposely not sent us this, as he intends to make a still larger series of observations before finally deciding so important a point.

I should like to add here that none of Jackson's work has led him anywhere near the locality in which Weyprecht observed. The question of Weyprecht's accuracy or inaccuracy does not, in consequence, enter into Jackson's map; but I know my friend's high opinion of Weyprecht, and the world may guess it from the fact that he has named an important bay in the west of the Franz Josef Archipelago after the commander of the Austro-Hungarian expedition.

A. M. B.

A JOURNEY FROM TONKIN BY TALI-FU TO ASSAM.*

By PRINCE HENRI D'ORLEANS.

THE President of the Royal Geographical Society has invited me to address you on the subject of my last journey. I know what an interest you take in all explorers, irrespective of the special subject they are studying, and particularly in those who are endeavouring to open up the mysterious regions on the borderland of India which form the frontier of China and Central Asia. My fellow-countrymen have told me of the kind welcome they received last year at your London Congress, which my travels alone prevented me from attending. For you all political rivalry is laid aside when you meet on the common ground of geographical science, to develop which you have contributed so much by your encouragement and help. I know the services rendered to humanity by the Geographical Society of London, whose reports I read regularly, and I am therefore particularly flattered by the honour you have paid me in asking me thus to read a paper before such an illustrious assembly.

In January, 1895, we left Hanoi and ascended the Red river, first by steam as far as Laokai, then by junk to Manhao, the port of Mongtse, where we formed our caravan. The voyage was unmarked by any particular incident, but we subsequently learned that had it not been for the favourable wind which enabled us to do the distance between Laokai and Manhao more quickly than usual, we should have been attacked by a band of pirates who had set out in pursuit of us. We had arranged all our plans. We intended to keep along the frontier of China till we reached the point where the Mekong penetrates Indo-China—that is to say, not far from the place where Francis Garnier left it; we would then ascend the river, following as nearly as possible its unknown course through China. The object of our journey was to reach Tseku on the Tibetan frontier. Above Tseku the course of the Mekong has been followed by French missionaries. Our halt would be at Talifu, the great western market of Yunnan. Nothing had been settled about our return journey; we intended to do the best we could according to our means and circumstances.

* Paper read at the Royal Geographical Society, May 18, 1896. Map, p. 656.

Such were the main lines of the itinerary which we proposed to follow: if we succeeded, we were free, on the one hand, to explore a country which interests us particularly on account of our possessions in Indo-China, as it forms the natural zone for peaceful relations and commercial expansion. By collaborating with the work of the Pavie mission on that part of the Chinese territory which forms our frontier, we should unite its operations and those of the staff around Mongtse, Kaihoa-fu, and the Tonkin border, with the older but not less admirable operations of Francis Garnier. On the other hand, it would permit us to take up again, from south to north, that essentially French undertaking, begun thirty years ago by Francis Garnier. The course of the Mekong through Yunnan, that is to say, for over 600 miles, extending from the frontier of Tibet to that of Laos, is still unknown. It was meet that the scientific conquest begun by Frenchmen should be continued by Frenchmen; we had a plan, an idea, and faith, and if we had not the certainty, we had at least confidence in the success of our enterprise.

We arrived at Mongtse on February 16, 1895, and during the eleven days which we spent in this town we were able, with the valuable assistance of M. Guérin, then acting as consul, and of Père de Goastarzu, to organize our caravan, buy animals, hire men, and send on before us by the main road to Talifu a part of our baggage and our money.

On February 27 we left Mongtse. Our troop consisted of our three selves (your servant, M. Roux, lieutenant, and M. Briffaud, one of the first colonists at Tonkin) and two Annamites,—Sao who had already accompanied me in my voyage in the Laos country, and who joined to the qualities of a devoted servant those of a good hunter and an excellent caterer—and Nam, who was our cook. Our interpreter was a Chinese of Shanghai, whom I was lucky enough to discover in Langson. It is very difficult to find French-Chinese interpreters at Tonkin, and especially one speaking the Mandarin dialect such as is used in Yunnan. We had a "makoteu" (head muleteer), with six men under him, and our cavalry consisted of twenty-seven animals (mules and horses).

We returned to Manhao, where we arrived March 1. During our short stay at Manhao both Roux and myself had discovered traces of a road on the right bank of the Red river. This was fortunate for us, as the inhabitants of these regions are not lavish in giving information, and our men and the interpreter not being at all anxious to leave the beaten track, we were continually obliged to resort to artifice and ruse to drag them off the high-roads. During the whole of the journey from Mongtse to Talifu—that is to say, during three months—the chief difficulties we met with came from the muleteers themselves. At the mercy of sordid, grasping followers, who cared nothing for our interests, and badly served by a supercilious interpreter, whose bearing towards us was at times insolent in the extreme, there was nothing for it but to be patient; we had to stifle our feelings, and meet murmurs and

reproaches with the iron wall of indifference. It is only fair to admit, however, that there was some excuse for the discontent manifested by our troop, for the trade of bearer is hard, especially in the region through which we were passing. The country is very hilly; it was one continual up hill and down dale, with very steep slopes, and over a stony, damp, and slippery road. Our poor animals struggled over a surface which gave them no hold, and fell constantly. We forgot what level ground was like. To add to our discomforts, we had to endure that of bad weather—dull, rainy, with continual fogs. At the end of two days our bearers were in despair, and spoke of leaving us. Some gave way like women and shed tears, and we had to bring out a whole arsenal of promises, and paint dazzling pictures of future pleasure in the big towns, in order to get them to go on. I do not add to the number of bodily discomforts those of board and lodging, but imagine the blackest, narrowest, most sordid "holes," and perhaps you will be able to form for yourselves an idea of the dwelling where we turned in for the night. The room which served us for sleeping and cooking was sometimes so dirty that we were glad to seek refuge in the stable or granary, and spend the night on the straw.

But if our bodily discomforts gave us cause to complain, at least as regards study we had ample satisfaction. We came across highly interesting native populations, and I was able to take a good number of photographs and notes. My friend M. Roux devoted himself especially to the topography of the country, and when the weather was fine enough the observations of the theodolite and sextant enabled him to rectify his itinerary. M. Briffaud superintended the caravan, often a most ungrateful task, and with the division of labour thus clearly defined, we hoped to get through more work.

On March 13 we reached Issa, a pretty town surrounded by large trees, and built on several hills overlooking the Red river. It formed a smiling picture, which threw a bright note of gaiety over the monotony of the bare hills overhanging the river. The sight which met our eyes during a day's halt at Issa made us partly forget the worries of the Chinese crowd. We were surrounded by that yellow, dirty, insolent multitude which we were to find again in every town of any importance, and which, without being openly hostile, fidgeted and buzzed around us like a swarm of mosquitoes. How greatly I prefer a beautiful prairie in the mountains, with a clear stream and a meagre dinner, but great tranquillity and freedom, to the good inns and civilization of the towns! From Issa we made a turn towards the west, and recognized again the valley of the Red river, which we left definitely almost immediately after.

At Tayangka we noticed, branching off from the road which rejoins the highway of the north, a path going west, and the mayor of the village, whom our interpreter questioned for commercial information,

informed us that it was part of a little road used in the dry season by tea and cotton caravans, and he gave us the names of the various halting-places. We did not hesitate a moment: here was a new road—"Siao lou," little road, said the bearers with a grimace—if mules can pass, so can others; forward. And this is how we reached Ssemao on April 6, having traversed, since leaving Manhao, nearly 350 miles of unexplored country, across which Messrs. Bourne and Colquhoun had declared the passage impossible.

The universally hilly country is partly cultivated as rice-fields. That still under water lies on the hillside like a giant staircase whose steps shine like glass. The effect is strange. One cannot but admire the wealth that the Chinese obtain from the apparently unwilling soil. The smallest plot of arable land is turned to account. The native populations are less industrious than their Chinese rulers. We met with interesting tribes: Lolos, Yaos, Pais or Thais, who are only Laotians, and lastly, the Hu-Nis. The latter are probably the aborigines of Yunnan, whilst the legends of the other tribes extend back to the north and to the east. According to the general impression, the Hu-Nis have in past ages inhabited the hills of Yunnan.

The Hu-Nis, though savages, are generally peaceful, yet are accused of piracy by the Chinese, to whose exactions they will not always submit. We got on very well with these natives. Nevertheless, we twice found these relations slightly strained. Having taken up our quarters for the night in a cottage in the midst of fields, where there were only three inhabitants, I had to unpack my valise, which the men had not fastened the previous evening. The next day it had disappeared. How were we to find it? One of the inhabitants must be guilty. We held a council, and decided to make one of them a prisoner, allowing his relations to ransom him by restoring the stolen property. The imbecile man, after having been fed by the hands of his wife, limped after us. Next evening nothing took place, and we were obliged to let our prisoner go; but the amusing part of the story was that the native, probably finding that he was better fed with us, was not at all anxious to leave us, and we were obliged to adopt strong measures to get rid of him. Once again, Sao and myself, surprised by the nightfall, found that we could not come up with the caravan, and were, therefore, obliged to take refuge in a Hu-Ni house, where we asked for some straw to lie on. After a few minutes the courtyard was invaded by armed villagers, to whom a child had given the alarm, and who took us for pirates. The muskets were fixed full at us. There was no way of escape, and I saw that we were in for a disagreeable encounter, when Sao had a bright idea. He wrote with his finger in the sand of the courtyard who we were and what we wanted. He did not speak Chinese, but wrote it, as the characters were the same as those of the Annamite. Explanations followed, and we were allowed to pay for board and lodging. After

a night passed among half-tipsy armed men, I was delighted to find myself next day in the saddle in the forest.

Ssumao is an important commercial centre. The fixed population is perhaps ten thousand souls, but the floating population, composed of caravaneers and muleteers, who live in the many inns of the outskirts, is considerable. The two principal articles of commerce are, tea, which is exported throughout China; and cotton, sent to the Red river to Yunnan-Sen, and even as far as Ssu-chuan: this cotton is brought by caravan from the Shan States, and even from Burma. From information that I gathered at Ssumao, I learned that there is an annual export trade of 7000 piculs of tea, and the same quantity of cotton. We heard that two Englishmen had just left the town. This news was not calculated to rejoice our hearts. Reconnoitring parties are numerous in Yunnan, and there is a race between the French and English, and even amongst the French themselves. The field of the unknown is day by day being reduced with marvellous rapidity, and to find unexplored ground on the map one must hasten. At Talifu we were told that one of these Englishmen was Captain Davis, who arrived from Burma by way of Tenguyeh and Tali, intending to return by Mienning, Ssumao, Puehrfu, and Tamano. We twice crossed the itinerary of these travellers, and were lucky enough only to travel along 120 miles of the same road.

We only stayed four days at Ssumao, just long enough to rest and to exchange our sick mules for healthy animals. We give nothing but praise to the Chinese mandarin, who was most amiable and polite to us, and we no longer heard in this part of Yunnan those offensive words which continually assailed our ears in Ssu-chuan, to which we were obliged to reply. The crowd is troublesome, but not hostile. When we left Tonkin, people were speculating on the probable effects of the war with Japan. They can rest assured that scarcely an echo reached the provinces, and, with the exception of a few mandarins, it was absolutely ignored.

On April 11 we left Ssumao for the valley of the Mekong, which preceding travellers had depicted as unhealthy and dangerous. They even said that it was difficult to get the bearers to accompany one. I can only say that our men did not raise the least objection to following us. Between Ssumao and the river the road runs through valleys surrounded by chalky hills and peopled by villages of Pais. On April 15, at Longtane, we stumbled on a colony of Pais, who resembled in every respect the Shans that I know. Like them, they wear their hair in pigtails, and are tattooed. The Chinese appear to have for these Pais particular attention, for they give their soldiers rewards, in the shape of medals, that they do not give to any others. Longtane appears like a desert island in the midst of tribes who have adopted, if not the language, at least the costumes, habits, clothing, and head-dress of the

Chinese. This is the only spot where I found the real Thais, residents of China.

On April 18 we reached the borders of the Mekong. I was really pleased to see this old acquaintance again—this river that I had already seen in Cochin-China, in Cambodia, that I came down as far as Laos, and that we crossed far away in Tibet. It was as if we had come across something French—on the border of this river near whose banks so many French had fallen, from Massie, Muhot, and De La Grée, to the most northern point of unknown countries where lie those brave French missionaries, those unknown heroes. The river here is from 350 to about 500 feet wide. It flows partly between wooded hills, whose slopes are less steep than those which form the valley of the Red river. Rapids render navigation impossible in some places. No craft can follow its entire course. All that can be done is to cross it at certain points on great ferries. Up to May 20 we kept to the right bank, except M. Roux, who with two men made an excursion on the left bank.

Before reaching Talifu we saw the Mekong from six different points; the last time was during our journey between Chuningfu and Menghoating. The march is difficult, as we had continually to cross the affluents of the river, so we changed valleys every day, and were continually ascending and descending.

On May 2 a slight bend across a series of wooded mounds made us insensibly pass by the basin of the Salwin, where we remained some days. It is very curious to find such a low watershed between the basins of two such important rivers. This one has scarcely a height of a few hundred metres. Formerly the regions that we crossed were inhabited by the Lochais, near neighbours of the Lolos, but possessing no written language like their brethren. Some years ago the Lochais were at war with the Chinese; but now peace is established, yet they are still wild. We were obliged to stay several days among them, during which we saw one of their national dances—a stay which was not at all pleasant.

A box belonging to M. Roux had been stolen—a loss the more serious to us as it deprived us of the result of our geographical labour. With patience, the promise of a reward, and the help of the mandarins, my friend was enabled to recover his property. We arrived at Meinning on the 4th, and found ourselves in a purely Chinese country. Although the road improved, the difficulties with our men increased. They wilfully mistook the way to follow the most direct and main road to Tali, and we were forced to retrace our steps to make them follow us. Thus we lost two days. Then we were obliged to leave the chief muleteer behind us, as he was unable to go on, having been severely attacked with a knife by one of the men, who bore him a grudge since we left Muong-Li more than six weeks ago; both were in the wrong, and the aggressor fled.

A few days after we had to break with the interpreter. This was serious, but necessary. François, as he called himself, having become overbearing, was continually stirring up discord amongst our followers. Thinking himself indispensable, he went so far as to insult one of my companions. Two blows soon brought him to his bearings. Thinking that we would beg him to remain, he asked to go. I immediately gave him notice. We were only a fortnight's journey from Tali, and I could speak enough Chinese for our daily needs.

We went from town to town, through lovely plains, rich, inhabited, and large basins—Yun-chu, Shun-ning-fu, and Menghoating. Between these two towns we saw for the sixth time the river Mekong, which we crossed by a bridge. The monotony, the uniformity of this purely Chinese country, made this part of the journey very wearying. We hurried on, making long stages, only anxious to arrive at our destination.

On May 21 an incident happened, the consequences of which might have proved serious. My faithful Sao fell from his mule, and rolled about 20 yards down a very steep incline. A shrub broke his fall, consequently he was not hurt; but if he had fallen a few yards further he must have been killed. On May 26 we discovered the lake of Tali, a long lake, which is bounded on the east by hills bare to the summits, separated on the west by high mountains and a table-land of several kilometres. On this plain are to be seen traces of old fortifications, the remains of the Mussulman insurrection, under which run the telegraph wires of Burma, important outskirts of many villages, and, surrounded by trees, lies the town of Talifu, with its wide streets and low houses. The evening we arrived, our men by mistake took us to the house of the English Protestant minister, who was absent; but his wife and sister-in-law sent their servant to show us the way to the Roman Catholic mission-house. Our men, however, who had never seen any European ladies before, were so astonished at the sight of these new faces, that they allowed two of our mules to be stolen. Fortunately, the police were informed and paid, so we got them back next day. Thus ended the first stage of our journey. We remained with Father Leguilcher, an old French missionary, who had during the Mussulman war conducted François Garnier into the fortifications of the town.

Father Leguilcher, who had been more than thirty years in this country, gave us some valuable information on its history, especially during the Mussulman war and the taking of Talifu by the Chinese, thanks to the betrayal of the chiefs, who had been bribed by their adversaries. He described to us the assassination of the unfortunate Margary, which had been arranged by Lisen Tajen, at the command of the famous viceroy, Tsen. Tsen was punished for his crime by the continual visions in which he was haunted, during the latter part of his life, by the ghosts of his victims.

During the three weeks that we stayed at Talifu we reconstructed

our caravan by buying fresh animals and sending away our old muleteers to give place to those recommended by the missionary.

On June 16 we set out once more. Our new company was greatly superior to the one with which we started from Mongtse. Our head muleteer was a serious, grave, conscientious man, possessing all the qualities which the people of his race generally lack. We never heard an oath nor a word of complaint from his lips. We could place complete confidence in this chief, and it was for us a perfect rest not to be obliged to continually interfere during the march of the caravan.

Father Leguilcher found an interpreter for us, who could not speak a word of French, it is true, but managed to make himself understood in Latin. For the first time in my life a sense of the usefulness of my classical studies was borne in upon me. Joseph, as our new interpreter was called, was a Chinaman, who differed greatly from his countrymen. Reared from his youth by Father Leguilcher, he had been formed, and well formed, by this missionary. Devoted, faithful, and indefatigable, interested in everything, understanding all our wishes, he became a real friend to us, and it was a pleasure to talk to him in his Latin-Chinese jargon.

As our idea was to continue the exploration of the Mekong, we struck to the east. A lovely road passing by two hills, one of which was 10,000 feet high, brought us to Yumlong Chu. Our animals went well, the men were good-tempered, and everything was perfect. At Yumlong Chu we were shown a road leading to Feilung Kiao, a bridge over the Mekong. This bridge is the last that one meets on that river—I do not speak of the Tibetan bridges—till one arrives at Chiamdo, the highway from Pekin to Lhasa. Fifty years ago the Fathers Huc and Gabet, and more recently Captain Bower—in his splendid journey across Tibet—passed over them. So we once more crossed the river, but on the right bank we were told that the road descended to the So, Tenguyeh, and Burma. To go further north there is no road unless one crosses to the left of the bank; the right bank is inhabited only by savage tribes, where civilized people—which the Chinese consider themselves—are never to be met with. This was a fine look-out for us. They told us of the trace of a road leading to Lao, a village at three days' distance from Feilung Kiao, on the right bank. It will be all on our way, and we can see whether we can keep on. Again we start off. We go from stage to stage, and, thanks to information more or less exact, we reach the valley of the Salwin. Before arriving in this valley we were obliged to give ourselves up to those labours which rendered our journey so slow to Tseku: our men were forced to turn roadmakers. Each day they had to unload the baggage and make the roadway. We considered ourselves lucky if this operation did not take place more than twice a day. Our chief muleteer, his pick in his hand, ordered the works. It was a difficult task, and with our old troop we

should never have succeeded as we did. The patching finished, we led the mules across. To make things worse, we had a rainy season; the ground became slippery, and the animals, having no foothold, fell often. I remember, among others, one day when, at a particular place, we saw five of our mules with their loads roll down about 100 feet. We all had to go and pick up our pack-saddles, to mend them, and then to catch and re-saddle the animals, which we found calmly browsing at the foot of the ravine, as if they had been made of indiarubber, —all of which happened during a downpour of rain. We had still some hours' march before we reached the cottage where we were to pass the night, every one being obliged to drag along packages which had fallen. The caravan was broken up! I pitied our men—frankly, it was too much labour. At the first village we reached after these hard days some of the men left us, but we replaced them by natives.

Beyond Lao, at Luku, we were well received by the Chief Lissu, another official of the Chinese government. We were on the banks of the Salwin. This river, more than 100 yards wide, can be clearly distinguished, owing to its light grey colour, from the Mekong and Irawadi, which we will speak of later on. The rapids are formidable, and the water rolls in enormous waves. The *tussu* of Luku gave us precise information and a guide. After having ascended the valley of the Salwin, July 9, we again reached the Mekong.

The country is very wild; forests of pine and oak crown the heights which separate the two valleys. The Salwin in this latitude is almost 300 feet below the level of the Mekong, and its valley is in general wider, greener, and more thickly wooded. The Mekong, on the other hand, has the appearance of a great high ditch, supported between two mountains, sometimes rocky and forming profound ravines, sometimes sloping gradually to its banks in bare crumbly dunes. The depth of its waters must be considerable. The inhabitants could give us no information on the subject, and M. Roux, who had only a rope 160 feet in length with him, was unable to reach the bottom. The situation of the valley accounts for the difficulties of the march. We started on July 9, and it took us forty-one days to reach Tseku, a distance of less than 200 miles. On the right bank the track is rarely wide enough for mules to make use of, the footpaths being very narrow and often dangerous. We frequently had to hire gangs of labourers to force a passage for us, and our advance was in consequence very slow. But the study of the tribes we met was some compensation for the difficulties of the journey. They are highly interesting and very little known. Among others we will mention the Lamajen and the Lissus, and these latter—in spite of the reputation for ferocity they have gained among the Chinese—received us well. One evening we were warned that the villagers intended to attack us, but they evidently only meant to frighten us, for a few firm words smoothed things down, and we got off none the worse for a false alarm.

The Lissus and Lamajen, dwelling on the banks of the Mekong, are very easily alarmed. These poor people suffer greatly from the incursions of the Lissus of Salwin, who are dangerous brigands. In nearly every village we hear tales of a band coming from the other side of the mountain two or three days before, and carrying off cattle, and sometimes men, who, if they are not redeemed by their relations, are reduced to slavery. I asked the villagers why they did not imitate their enemies and make raids in their turn. "They are stronger and better armed than we are," was the reply; and there was nothing further to be said. In the evening we made the villagers sing and dance. Their movements are picturesque, and remind one of the country dances of Auvergne. When they sing, they usually improvise in honour of the great men who have lived amongst them to bring peace and prosperity.

During this part of our journey we were the victims of a serious robbery. Roux's valises, containing his instruments, theodolite, and hypsometer, were stolen during the night, and, in spite of a day's halt and a high reward, we were unable to recover them. After this we were obliged to be content with the marking of the compass.

At Into we came across a French missionary, and two days later, on August 15, we were obliged to cross again on the left bank of the Mekong The precipitous cliffs of the right bank completely blocked our passage, and we could only get across by means of frail canoes, which we launched over the rapids. Our interpreter Joseph, who felt most uncomfortable about the matter, gave a "Deo gratias" of satisfaction when he reached the opposite bank. This circuit on the left bank of the Mekong allowed us to visit a little kingling, Mosso, whose influence we wanted when we went west towards the Upper Irawadi.

On August 19 we crossed the river again by means of a rope bridge, down which our men and animals slid one by one, seated in a little wooden saddle. It is the Tibetan way, and the first time one makes use of it, one is somewhat astonished to find one's self hanging 70 feet high over a mountain torrent; but one soon gets used to it. We stopped on the right bank at Tseku.

Tseku is a station of the Tibet mission. Father Dubernard, who has lived in the neighbourhood for twenty-eight years, was formerly visited here by the Englishman Cooper. The latter was so touched by the kindly welcome he received from the missionaries, that when he left Tseku he shouted, "Vive la France!" Since his time no European traveller had visited the town; you can imagine, therefore, the hospitable reception that our fellow-countrymen gave us. Without their aid and support, we should never have been able, not merely to have brought our enterprise to a successful issue, but even to have attempted the latter part of it. I am glad to be able on this occasion to render public homage to the generosity, disinterestedness, and courage of those who make the name of France beloved in a far-off country.

At Tseku we had finished exploring the course of the Mekong in China; we had thus carried out our purpose, and ended our mission. Now we had to return.

On examining a map of these little known regions, published in the book of Colquhoun, we observed a dotted line which ran through the Salwin, the basin of the Upper Irawadi, and leaving Tseku, ended in Assam. This is the proposed direct route from China laid down by Captain Blakiston. Why should we not try it? It has never yet been done; but, with courage, health, and energy, we would perhaps succeed. We would try to keep as nearly as possible to the southern frontier of the Zayul, and try to settle definitely the problem of the Salwin and Irawadi by crossing the upper reaches of the latter near their source. The information that we gathered about the country stretched out before us was vague. Beyond the Salwin there was a large river, called the Kiukiang, which flowed through a very difficult country, inhabited by naked savages. That is all they could tell us. No matter; let us go, and we shall find out for ourselves.

Whilst I rested, and tried to throw off the fever which had prostrated me, M. Roux made an excursion towards Atentze, three days' journey from Tseku, on the left bank of the Mekong; he was thus able to fix a starting-point, from the indications given by other travellers, on which to base the calculations of the compass. At Tseku I was lucky enough to find some hieroglyphic Mossos manuscripts, of which two specimens have already been brought to Europe. These have not yet been translated. Some sorcerers told me what they were about, and I hope they will prove of some interest to philologists. When my companion returned the fever had left me, and we began to make preparations for our departure.

On September 10 we left Tseku. Our caravan had been reformed. We had sent to Talifu—by the high-road Wei-si, Likiang—the greater part of our mules, with our Chinese muleteers, our collections, and everything that was not absolutely necessary to us. We kept fifteen mules ourselves. Besides our interpreter Joseph, two Chinese, and the Annamites, our troop consisted of twenty-six men from Tseku and the surrounding country. These men dress and speak like Tibetans, but most of them, having intermarried with the different tribes around, are polyglot. Nearly all spoke Chinese, and some Mosso, Lute, and Lissu. The greater number were Christians. These men were both bearers and *mafus*. They undertook to go with us wherever we wanted, and for as long as we wanted them, and we on our side undertook to send them home by the easiest and least dangerous road. After two days' ascent, we left the valley of the Mekong and struck west by a defile of astounding grandeur. At the end of a week we found ourselves again on the banks of the Salwin; the mountain we had crossed was 11,000 feet high. The huge peak that towers above it received from us the

name of Francis Garnier. During our passage we suffered from continual rain. Our animals constantly slipped, and we were obliged to walk the whole way.

From Tionra, where we saw the Salwin again, the river has just the same appearance which we remarked at Luku; the same grey colour, and nearly the same width; it was still 300 feet across, and one felt that it had come from a long distance. There was a difference of two or three degrees centigrade in the temperature of the Salwin at Luku and of the Mekong at Feilung Kiao. We found the same difference in the degrees marked at Tseku and at Tionra. The Salwin here bears the same name as the Luku—Lukiang or Lutzekiang—and it is known by the same designation as far as Mekong in Tibet. When we were ascending the right bank of the Mekong between Piutsen and Tseku, we used to question the inhabitants about the river lying west, and they always called it the Lukiang or Lutzekiang. The river that flows by Tionra is, therefore, unmistakably the same as that which passes Luku. These conclusions are important, as we shall see, in identifying the course of the Salwin. We easily crossed in little canoes, thanks to the aid of the Lutze tribes. We were able to establish friendly relations with the lamas of Chamutong, who, seeing that we were not going towards Tibet, sold us butter and provisions.

A watershed with a pass 11,500 feet high rises between the Salwin and one of its affluents on the right bank. It would have been too circuitous a journey to seek its mouth, so we were obliged to cross the mountain. At the foot of this ascent we were compelled to send back our mules. We packed them off under the guardianship of two Tseku men, and we sent back at the same time any baggage which did not seem to us absolutely indispensable. Henceforth, till November 18, we made our way along paths which were quite impossible for animals. Although very hilly, the landscape is somewhat monotonous in its general aspect—always the same wooded mountains, with their deep valleys, at the bottom of which flow large torrents of deep blue water. In three months we crossed seventeen chains of mountains. Roads, in the true sense of the word, there were none. We scrambled along the declivities on hands and feet, using our hands as much as our feet, and clutching hold of every branch within reach. We climbed rocks, seeking a foothold in the most trifling irregularity; in places where the rock is too high to be attempted, the occasional passers-by have propped the trunk of a tree marked with notches, thus forming a ladder up which we hoisted ourselves. The torrents are crossed by means of cane bridges, on which one hangs in a kind of hoop and propels one's self along with feet and hands; or else one sets out in a bamboo, on which one has to balance. When the water is not too deep, one wades across. Certain torrents are used as roads. This is the most painful kind of march. For two or three days we followed one, leaping from stone to stone,

slipping, scarcely able to keep a footing, falling incessantly. This constant exercise of the equilibrium ends by becoming exasperating.

Notwithstanding our bodily discomfort, we were fortunate enough not to have any disagreements with the natives. These mountains are inhabited by the Kiutzes (it is the generic name given to them by the Chinese). The Kiutzes are a fine race of men; they are of medium height, and, with the exception of a little girdle, generally naked. They have pale complexions, large black eyes, and regular features, and their fine faces are sheltered under a forest of black hair which falls to the shoulders, and is cut in a coronet on the forehead. The women are ugly. The Kiutzes are timid, but, thanks to the good reputation we had won for ourselves, and which preceded us from village to village, they received us well. When I say "village," it is only a figure of speech, for the largest did not consist of more than ten huts scattered over the mountain-side, and the nearest together were as much as three days' journey from each other.

Our most pressing anxiety lay in the difficulty we had in catering for our troop; we often found it difficult to obtain the absolute necessities of life for our men, and the least delay in our march between two villages was a source of danger to us. One evening in particular we found ourselves in a truly critical position; we had three days' provisions with us, and three days' journey lay between us and the next village, when we found ourselves stopped by the swollen condition of a torrent. It was impossible to cross on a raft, we could not ascend the stream, and there was no roadway that could be of any service to us. The natives, to console us, observed that when the waters were high, people stayed at home. Mercifully they subsided during the night, and next day we crossed, thus getting out of a most unpleasant fix.

The first height we crossed, on leaving the narrow valley of the Salwin, brought us into that of the Kiu-kiang, the great eastern branch of the Irawadi. By a bend in the river we could see towards the west an opening which we intended to follow as far as its confluence with the second branch of the Irawadi—the Telo. We should cross the latter also. Every time we found ourselves at a certain height during this part of our journey, we could see stretching northward the large chain of Zayul Alps, which separates the basin of the Lohit Brahmaputra from that of the Irawadi.

About the middle of November we found ourselves approaching the large plain of which we had heard a good deal for some time past. Dazzled by the descriptions of the natives, and also by the idea of walking on level ground, we had looked forward to that plain as to a promised land. There we should find salt, of which we had had none for ten days; lard and meat, which we only got occasionally; and vegetables, whose taste we had nearly forgotten. This would be paradise! Khamti, which we reached on November 18, is, indeed,

a large, very low plain (900 feet above the level of the sea), watered by the western branch of the Irawadi, the Nam-kiu. The inhabitants are Thais; there we found the same race, the same dress, the same writing, and the same religious objects as in the Laos. It was interesting to find again on the borderland of India the *débris* of that race which extends north to Ssu-chuan, south to the peninsula of Malacca, and east to the river of Canton. Though more civilized than the savages of the centre among whom we had been living, the Thais are less hospitable. In spite of the relations they have had with the English who have already appeared at Khamti, and with the authorities of Bhamo to whom they pay tribute, they were most repugnant in their dealings with us. Their rapacity was extreme, and both our money and guns had to be brought into requisition in our advance. Thus it was with pleasure that we left the inhospitable valley of the Khamti on November 24. We intended to proceed to Assam by the road, passing by the sources of the Nam Dapha, a highway as yet not used by Europeans.

This part of the journey was the most dangerous and the most painful. To the difficulties which we already were acquainted with—torrents to follow and cross, five successive mountains to climb, march over rocks, and balance to be kept on bamboo bridges—was to be added a series of obstacles of another kind. Every day something unexpected happened to check, or at least delay, our march. We were not accustomed to so much ill-luck. First five, then three native porters fled, terrified by the length of the road. We had, in fact, to cross 90 miles of desert, forest, and mountain. We were obliged to leave the last village with eleven supplementary bearers in place of the fifteen we wanted. Disease, which till now had spared us, struck our troop; the men fell ill with fever, the germs of which had been sown in the misty nights in Khamti. They became anæmic, harassed, and several could no longer carry their loads. We were obliged to advance, however. The stronger came to the help of the weaker. They helped one another, and we kept on. Some days later my companions were attacked by fever. When they fell ill we had been eight days on the road, and were nearly half through our journey. In the state our men were we could neither advance nor retrace our steps. A month's rest in an unhealthy country would probably be of no benefit to them. We could not send for fresh supplies and eat what we had, because we ran the risk of getting no more. There was nothing for it but to go forward. The column was divided into two parts, and the weakest were to press forward with the natives and the guide. They were to mark the road, and if they arrived before us at a village, they were immediately to send on provisions. Ourselves, with the strongest, were to wait a day in order to let my friends rest. That was all that could be done, and even that was risky.

Roux found that he was not fit to march, even after a day's rest. He begged me to depart with the second column, leaving him behind with two men and twelve days' provisions. Bitter as it was to leave my sick comrade alone in the mountain for perhaps a week, I felt it was my duty to do so. If I stayed I should only add one more to be provided for out of the meagre store which remained to us, and I could be far more useful in pushing forward as fast as possible and seeing about the revictualling. Briffaud, notwithstanding his weak condition, came with me. Two days after we crossed the pass, which is 10,000 feet high and slightly covered with snow, which separated the basin of the Brahmaputra from the Irawadi. Before us lay the great Indian plain; that is to say, the end of our voyage—and safety. The joy of accomplishing our purpose was lost to me by all the cares which still troubled us. At the foot of the peak we found two men of the first column looking for an old man who, being sickly, could only walk with difficulty, and was lost in the night. Alas! he was not to be found. Tigers are numerous, and we never saw him again.

During the following days it was a forced march, with long stages. Every one did his utmost to husband his strength. We were flying before death. The men had only two meals a day—three cupfuls of rice with a strong addition of water. On we went; only one meal left; then nothing. We were obliged to leave behind two of our sick men who could not keep up with us. We would send them some rice as soon as we had it; the tent and cooking-utensils all were left. We only kept our blankets and one or two pots. Our march was continually impeded by fords, swollen streams in which we waded up to the armpits. The men had marched twenty-four hours without food, when we came across a man who had been left behind the first column, and who had a bag of rice. We were saved! What was more, we were informed that we were at only a day's march from a little village. We immediately thought of the sick men we had left behind, and offered a big reward to whomsoever would go to their aid. An old Tibetan, Jayo, rose and immediately returned, to bring back his comrades after giving them food. Here we were at the first village, inhabited by Mishmi. We picked up the first column, which, having started twenty-four hours before us, had only reached the village three hours before our arrival. We collected all the rice we could find, and sent it to the rear with two natives and one of our men. They could take six days for their journey and revictual Roux's little band, provided that he had been able to cross the pass.

We ourselves started for Bishi with one day's provisions. Our guide lost the way, and our troop were not in good spirits that evening; that was easy to understand. The following morning we fortunately found a fisher-hut—that is to say, some fish and a guide. This time we were really saved. On December 16 we reached Bishi, which is

inhabited by Singphos, a peaceful and hospitable tribe. We waited there for our friends. On December 17 the two invalids, accompanied by the brave Jayo, arrived; then on the 20th, after a three days' rest, which seemed very long and dull, Roux and his bearers came up with us, having had a very wearisome journey. We fell into each other's arms. All his men had been ill in turn, and he himself had been obliged to carry a half-load for one day. A sudden rising of the water had stopped the little caravan for two days; one of the men was very nearly drowned in trying to wade across, notwithstanding the rush of water. However, we were united once again, safe and sound, and in spite of the death of one of the men, we considered ourselves lucky in coming out so well from such an awful experience. I must say that, had it not been for the Tibetan men collected by our French missionaries, we should never have succeeded. I can give no higher praise than by saying that never did I hear them utter a single word of regret or complaint, even during the most trying periods.

To sum up the results of our travels, I may say that, besides our collections of natural history and geography, our notes and photographs, we had opened up 1500 miles of entirely new country. Among these figures I count the course of the Mekong in China. In the latter part of our journey from Tseku to India we were able to confirm the following facts:—

1. On the same latitude as Tseku the Salwin is a large, fairly deep river, coming from a long distance. The information given us by the natives and the missionaries, as well as by our own observations, enabled us to state that the Oi Chu of Tibet, the Lu-tze-kiang, and the Salwin are one and the same river.

2. The Irawadi is formed by three large tributaries—the Kiu-kiang, the Telo, and the Nam-kiu. Of these the Kiu-kiang pours the largest volume of water into it, and its source is further north in a well-known mountain in Tsarong, two days' journey from Men-Kong, *i.e.* 28° or 29° lat. north. The Telo issues from a mountain that we had seen further south. The mountain out of which the Nam-kiu has its source can be seen from Khamti, and is well known to the English.

The whole of the basin of the Irawadi is bounded on the north by the Zayul chain, which seems to be a continuation of the Himalayas, intersected by openings of the Dibang and the Lohit.

I am thus of opinion that the problem of the sources of the Irawadi is solved. What has caused certain geographers to imagine that it came from a further distance than the Salwin is the importance of its volume in Burma, compared to that of the Salwin at the same latitude. But we must call attention to the fact that where we crossed the upper reaches of the Salwin, which is only a narrow dyke about 25 miles broad, that of the Irawadi is about 115 miles wide, that is to say, four times larger than the Salwin. The upper basin of

the Irawadi is a large fen with three principal arms. Two of these receive a vast quantity of water from the group of mountains which stretch southwards to Zayul, rushing onward with a strong current. The formation of the river explains its importance above Bhamo or Mandalay, where they have received other important affluents—such as the Kiuho on the left and the Chindwin on the right, for example.

Such are the main outlines of our travels; while, with the documents which I intend to publish, and our collections, we bring back to France the souvenir of the welcome that we received at Sadiya in Assam and in all our journey throughout India.

It gives me great pleasure to thank you here for the warm reception given to me by your fellow-countrymen.

Before the reading of the paper, the PRESIDENT said: H.R.H. Prince Henry of Orleans has very kindly accepted my invitation, I am afraid at some inconvenience to himself, to come over from Paris, and give an account of his very remarkable journey from China to Assam to the Fellows of the R.G.S. This is by no means the first geographical expedition Prince Henry has made, when with M. Bonvalot he left Kulja, traversed Central Asia, crossed the high plateau of Tibet from north to south, and reached the near neighbourhood of Tengri-nor. You all, or many of you, are acquainted with his work round Tonking and Annam, but I believe his last expedition is the most interesting geographically, and certainly the one in which he encountered and overcame the greatest dangers and difficulties. I am sure the meeting will sympathize with him in his love for geographical exploration, and that it will feel the kindness he has shown in coming to us to-night. I will now request Prince Henry of Orleans to read to you the account of his very remarkable journey. We should be very happy, I am sure, to hear it in his own language; and it will be a still greater compliment, appreciated by us, if he elects to read it to us in English, as I believe he intends to do.

After the reading of the paper, the PRESIDENT said: I would explain that Prince Henry's map is not yet finished; that being distributed to-night is copied from the map prepared for the purpose of illustrating his journey by the Paris Geographical Society. I hope Sir Charles Elliott, the Commissioner of Siam, will address the meeting on the subject of this very interesting paper.

Sir CHARLES ELLIOTT: I think a great honour has been conferred upon me in asking me to speak on this occasion, as representing those who, from the north-east frontier of India, have so long looked with eager and anxious eyes in the direction of the territory which Prince Henry of Orleans has now cleared up, and who are ready to congratulate him in the truest spirit on his adventurous and successful journey. Although I had never any opportunity of taking part in active exploration myself, the problems on the north-east frontier have interested me, as they must interest all Indian officials in those parts. Many years ago, I placed at Sadiya a specially qualified and able officer, Mr. Needham, with the object of investigating the geographical points beyond our frontier. Mr. Needham made one adventurous and interesting journey to Rima, on account of which he received the gold medal of this Society, and he, with the help of the Pundit known as A. K., cleared up that most difficult problem, the course of the San-po, which we all believed flowed into the valley of the Irawadi under the name of the Mekong, but he never had the opportunity of penetrating in the region His Royal Highness has passed through. It may seem disappointing that none of our officers, with their advantage of proximity, should have performed this task, but I should like to explain that

great difficulties are put in the way of servants of the Government of India in prosecuting explorations of this kind. The Government always feels great anxiety, lest it should be led into political complications through any accident happening to one of its servants, for if he started on a journey of this kind, and was taken prisoner or killed, it would be compelled to rescue or avenge him. On this account, it is very seldom that officials of the Government can be permitted to carry on explorations of this kind, but none the less do they show an extreme desire to be allowed to make journeys of this sort, and deep interest in the results of those who have been more fortunate than themselves, and I am quite sure that every explorer, or would-be explorer, on our Indian frontier will congratulate His Royal Highness on his brilliant achievement, and will join with the cry of Mr. Cooper, when he left Saku after hearing the report of the journey of Prince Henry of Orleans, "Vive la France."

The PRESIDENT: We have here this evening two very distinguished officers belonging to the Indian Survey Department, Colonel Hobday and Colonel Woodthorpe, both acquainted with the neighbourhood of the region discovered by Prince Henry. I trust that one, if not both, will be so kind as to address some remarks to the meeting.

Colonel WOODTHORPE: I have had the honour of speaking to you on one or two other occasions, but I feel it is an especial honour on this occasion, when we have to congratulate a great nation adjoining our own, divided from us occasionally by political troubles, but individually, I believe, always friends. The first Frenchman with whom I made friends was my French master, forty years ago; I am happy to say he still writes to me, though he is eighty years of age, to congratulate me on any little success I attain. The narratives of the French explorers, François Garnier and others, have always had the greatest fascination for me, and it was with the greatest pleasure that I found I was to be associated with French explorers on the Mekong commission last year. I had a very pleasant time with them; they were very friendly on all occasions, and the kindness with which I was received in Paris by two or three members of that commission was extremely gratifying. Shakespeare says, "One touch of nature makes the whole world kin." I think one touch of exploration has a greater effect. The Frenchmen referred to as "those brave missionaries and unknown heroes" have carried on a great work for years past. Among them a man equally brave, but not so unknown, the Abbé Desgoudin, most highly respected by all explorers, I am proud to say is one of my friends, and did me the honour of sending his book to me some years ago. I, as an explorer, and as a worker in the survey of India in Assam, have always cast longing eyes towards that quarter which the Prince has traversed, and which he told us of this evening. A very distinguished member of your Society, Captain Gill, who came very near to India from the side of China, was also very anxious to cross that territory between India and the point at which his explorations ceased. Just before his lamented death in Egypt, he wrote to me, saying if we could get sanction to go across that route, he would gladly accompany me at his own expense; but the reasons given by Sir Charles Elliott prevented my performing that journey. I took a little trip in company with Colonel Macgregor over a part of the route described by the Prince. There were serious difficulties and obstacles, and I must congratulate His Royal Highness on having overcome these obstacles so successfully. I must also congratulate him on the able manner in which he has spoken to us in English; but for one who did not quail before all these difficulties and dangers, the difficulties of the English language can have no terrors. My short attempt to reach the Irawadi made me appreciate these great difficulties. With him, I have known what it was to cross rivers up to our necks, hardly knowing whether we should be able to get across or not. I remember that, coming back, we arrived at

a stream which, when we had crossed it only a month before, was not knee-deep, and finding 12 feet of water. Our only chance was to bridge it by felling a tree from the opposite side. Two or three gallant little Goorkhas of the 44th G.L.I. swam across, and cut down a tree from the other side. We had previously measured its height to see if it would span the river. The question was whether it would fall at right angles. These expert woodmen had calculated the exact angle, and fortunately it did. The trunk became wedged between the rocks and held firm. The top branches reached to the shallows, where they became embedded in the sand. We were all able to get across, though an hour after the crossing was made the river rose 2 feet over the bridge, and soon it was 10 feet under water. Tigers carried off three of my men on three separate nights from one of our camps; the Prince refers to this danger also. He said that in Kamti he met with a great deal of impudence. I am afraid that is the result of too much civilization. When I visited the Kamtis they were exceedingly civil and kind. They have since visited Calcutta, which seems to have turned their heads. I am exceedingly pleased to find that our geographers' views have been confirmed by the Prince's observations. In a paper Colonel Hobday prepared some time ago, he corroborates the theory Colonel Macgregor placed before you in his paper read in 1886, that the Irawadi did not come from any great lake, but rose in three great branches in the hills surrounding the small basin of the Kamti country. Colonel Yule said in his introduction to 'Rivers of Golden Sand,' "Colonel Hobday goes on to show that the vast discharge of water into the Irawadi binding the Mekong and Chindwin areas, tend to make it develop rapidly into a noble river." It is very satisfactory to us, who have always held that view, based on accounts received from native travellers. You will observe that some of the Prince's slides are very similar to the illustrations shown with my paper on the Shan tribes.

The PRESIDENT: Prince Henry of Orleans has, from what we have heard to-night from his own account, from Colonel Woodthorpe, and from Sir Charles Elliott, solved one of the few remaining problems of Asiatic geography; and I think we must all admire the resolution, gallantry, and high intelligence which enabled him to achieve this great success. I think it right that I should, in a few words, take the opportunity of the presence of this young French explorer to refer to the reciprocal good feeling which has almost always existed between the travellers and explorers of the two nations. The history of the intercourse between English and French geography has been one of friendly rivalry and generous emulation. Whenever that intercourse has become necessary, we have all felt that. More especially we felt it with the lamented explorer, François Garnier, who came over like Prince Henry to this country, and received the highest honour we have it in our power to bestow, the royal gold medal, from the hands of Sir Roderick Murchison in 1870. I then had the pleasure of making his acquaintance. He was not long amongst us, but he was with us long enough to form enduring friendships. I may mention among them that which he formed with Sir Henry Yule, for whom he had an affectionate regard, and with whom he corresponded until his lamented death in the discharge of his duty three years afterwards. The mantle of François Garnier has fallen on the shoulders of Prince Henry of Orleans. Prince Henry has emulated, and with no small success, the honourable and patriotic work of his predecessor, Garnier; and I trust he will be like him in this respect also—that when, after his very short visit at this time, he leaves the country, he will leave it with nothing but pleasant reminiscences of his English friends. There now only remains the pleasant duty of conveying the hearty and cordial thanks of this great assemblage to His Royal Highness for his kindness in coming here. Indeed, we have to thank Your Royal Highness for many things: for the trouble you have

taken; for addressing us so admirably in our own language, and in a voice which has enabled every one in this room to hear you, which I could see from the attention which has been paid. We have to thank you for the most interesting and important paper which you have read to us this evening; and while conveying to you the thanks of the meeting, the meeting will also, I am sure, wish me to convey to you our sympathy and our admiration for the splendid geographical work you have achieved.

PRINCE HENRY'S MAP.—The map is principally compiled from those which appeared in the *Bulletin* of the Paris Geographical Society, 1895, and in the *Comptes Rendus* of the same Society, 1896.

THE ERUPTION OF AMBRYM ISLAND, NEW HEBRIDES, SOUTH-WEST PACIFIC, 1894.*

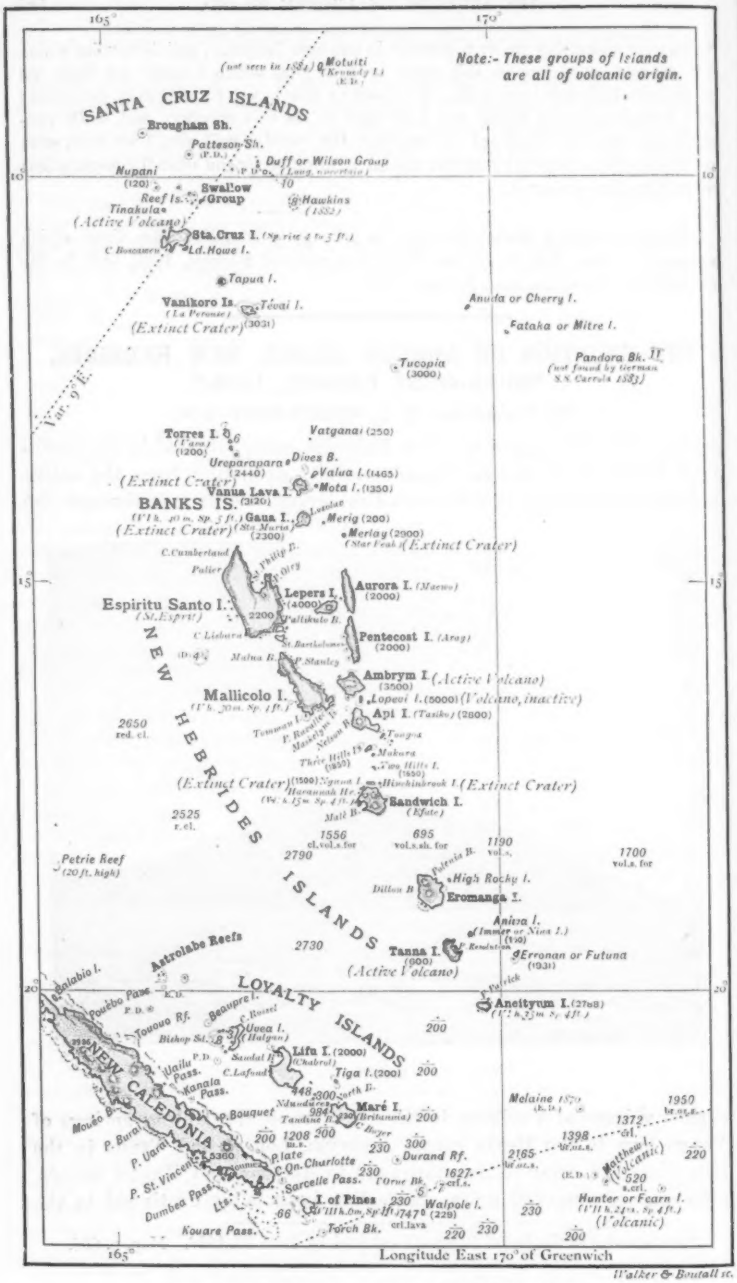
By Commander H. E. PUREY-CUST, R.N.

AMBRYM island is one of the New Hebrides group situated in the south-west Pacific, in a line of volcanic activity extending from the active volcano of Tinakula, in the Santa Cruz group, southwards through the

LOPEVI.

extinct volcano of Vanikoro in the same group, the boiling springs of Vanua lava in the Banks group, Ambrym, Lopevi, and Tanna in the New Hebrides, away to the southward to Matthew and Hunter islands, a distance of some 800 miles. This line is probably continued to the

* Paper read at the Royal Geographical Society, June 22, 1896. Map, p. 656.



Walker & Boutall sc.

NEW HEBRIDES, SANTA CRUZ AND LOYALTY GROUPS.

north-west through the Solomon islands and New Britain to Java, and to the southward possibly to New Zealand.

The New Hebrides are all more or less of volcanic formation, or exhibit signs of volcanic upheaval in the numerous elevated masses of coral limestone raised in distinct terraces, marking successive upheavals, to heights of over 1000 feet.

Of the active volcanoes, Tanna, near the south end of the group, has always been reported in a state of very regular activity ever since it was first visited by Captain Cook in 1774. In 1878 it was particularly active, when a severe earthquake and extensive upheaval nearly entirely destroyed the fine harbour of Port Resolution.

Lopevi, just to the southward of Ambrym, is a magnificent perfect cone of cinders rising from a base of 3 miles in diameter to the height of 4755 feet, with apparently a small crater at its summit. In clear weather it is visible from far and wide, and forms one of the finest sights in the New Hebrides. At present it is inactive, but it was seen in eruption in 1864 by the mission schooner *Southern Cross*, when Bishop Patteson was on board. Mr. T. B. Whytehead, at present chapter clerk at York, and then mate on board, says, "I think the eruption occurred about daylight on June 9. There had been a thin eddy of smoke round the crater for a day or two. When the explosion occurred it was preceded by some tremendous reports, and then a fierce rush of smoke and red-hot stones took place, the column ascending to an immense height. It then spread out like a mammoth umbrella, and the descent began. Some of the stones must have been large, for we could hear them falling into the water, and our decks were covered to a small depth with black impalpable ash. As the breeze gradually shifted the smoke from the crater, we could see the red-hot lava pouring over the edge of the lip where it had been broken down. It welled over in a succession of waves, which ran over and over one another until they reached the water, when they produced a furious roaring noise and a succession of waves outwards, whilst clouds of steam rose high into the air. This lasted for two or three hours."

Lopevi was again in eruption mildly some ten years ago, when the natives threw cocoanuts down the crater to stop it, but without any effect.

Ambrym is an entirely volcanic island. The centre of it is occupied by an extensive plain of ashes elevated some 2000 feet above the sea-level, and from 5 to 6 miles in diameter, with an encircling unbroken rim of hills all round seldom more than 100 to 200 feet above the level of the plain, possibly the remains of an enormous crater, and the basal wreck of a mountain which must have been some 10,000 feet high.

Near the western end of this ash-plain rise two of the highest summits of the island—Marum, 4380 feet, and Benbow, 3720, both containing huge craters about a mile in diameter.

Like most volcanic islands, vegetation grows very luxuriantly, particularly cocoanuts, which can be seen here in more abundance than in probably any other island of the group.

Numerous hot springs are found along the shore, especially on the north side, the temperature of the water ranging from 107° to 110° Fahr.

Captain Cook, when he first visited the group and named them the New Hebrides in 1774, mentions seeing two very high columns of smoke rising from the centre of Ambrym, and from the scanty reports of visits to the group from that time to this it has evidently always been in a mild state of eruption, but never on such a scale of magnitude as we had the luck to see in October, 1894.

SECTION THROUGH AMBRYM ISLAND FROM NORTH TO SOUTH. SCALE 1 INCH = 5·75 MILES.

SECTION THROUGH AMBRYM ISLAND FROM EAST TO WEST. SCALE 1 INCH = 5·75 MILES.

ROUGH SECTION OF LAVA-FLOW AFTER ENTERING THE SEA, OCTOBER 16, 1894. SCALE 125 YARDS = 1 INCH.

H.M.S. *Dart* had been employed surveying the north coast of Ambrym, and at 6 p.m. on October 15 the survey was completed, and the ship anchored for the night at Dip point. During the night a slight glare was seen over the centre of the island, but thought to be only a bush fire. However, the next morning (October 16), on getting under weigh at 6 o'clock and rounding the point to the eastward, a vast cerebreform mass of cloud was seen rising to a great height over the centre of the island, and, when a little further along the coast, black smoke was plainly visible behind the low coast hills rising in dense columns, and it was evident that an eruption of the island had commenced.

Soon it was apparent that a lava stream was rapidly finding its way towards the sea; the course of the stream could be distinctly traced by

the dense black smoke from the burning bush as it wound its way through the hills like a great fiery serpent. Occasionally a puff of white steam would show where water had been met with, and, it being evident whereabouts it would finally reach the sea, the *Dart* was steamed

PHOTOGRAPH OF STEAM COLUMN ABOUT TWENTY MINUTES AFTER THE LAVA-FLOW ENTERED THE SEA ON OCTOBER 16.

up to the vicinity and stopped some 300 yards off the shore to await events. As the head of the stream got nearer, bursts of flame could occasionally be seen, and the noise was most indescribable and awe-inspiring. Presently the head of the stream appeared—a red-hot, rapidly moving mass of molten lava, some 30 yards wide, with lumps of clinker tossing about on the surface. In another moment it entered the

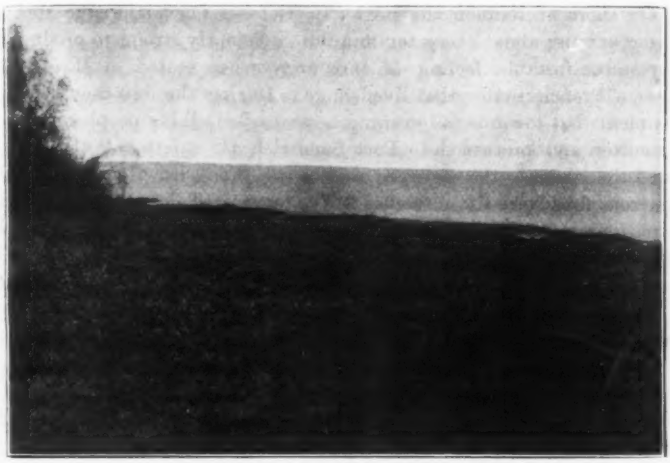
sea, and then a most wonderful sight was seen, such as none of us who then saw it will probably ever see again as long as we live: a dense pillar of steam rapidly rose straight up to a height afterwards measured by sextant and found to be 4600 feet. There was no explosion as the lava touched the water, but a few seconds later enormous bubbles of water commenced to rise some 100 feet or more, like the explosions of heavy submarine mines, and then burst violently outwards in radiating tongues of water and black masses of presumably lava. Considerable waves began to set up and steam to rise from the water in the vicinity, and, as both the violence and area of the explosions appeared to be rapidly increasing and spreading outwards, the *Dart*, which had a steamboat towing astern, was moved off to a safer distance.

Fine dust and *débris* of burning bush now began falling. Canoes full of natives were leaving the shore in all directions; many natives could be seen running along the beach seeking a place of safety; one woman was seen carrying another on her back. The steamboat picked up several canoes and towed them clear of danger towards Dip point. Many of the natives wanted to abandon their canoes and come on board, but, as I wished to proceed at once round the other side of the island and get a view from to windward of what was happening, I persuaded them at length to go ashore at the mission station, promising to return again in the evening—"No gammon," as they said.

From the weather side, *i.e.* the south side, it was seen that all the western end of Ambrym was enveloped in smoke; a dense black wall of it was rising from the vicinity of Fo-luk, one summit looking as if all the bush was burnt off, with the exception of the bare trunk of a very large tree that stood out against the blackened sky, and smoke and steam were rising from the crater of Benbow, to the westward of which all was black as night.

On our way back, as we rounded Dip point, the cliffs, which are here composed of loose volcanic sand, were seen to be falling down into the sea in constant landslips, and at this moment a fresh outbreak of smoke was observed, apparently just to the southward of Single Palm hill, behind the mission station. Dust was falling heavily, and we could only just see the shore when we anchored only a few hundred yards off it. Flames at that moment appeared over the gap of the hills behind the mission, and the noise of the explosions and burning was continuous and alarming. The natives could be seen assembled on the beach in groups, and I accordingly sent in boats to take off as many as cared to come. On landing, the ground was found to be in a constant state of tremor, and the natives, as well they might be, in a very terrified condition, the women and children crying and huddled up together. Over eighty men, women, and children were soon embarked, together with all their effects, and our little quarter-deck, packed as full as it would hold, presented a strange sight. Some of them were our

friends of the morning, but the greater number belonged to the mission station. Dr. Lamb, who had established here the first Medical Mission in the islands only about two years before, and already done an immense amount of good, had, in the beginning of 1893, seen the mission utterly destroyed by the great hurricane of that year; having been rebuilt, it was, a few months before the eruption, again destroyed by fire, and he had returned to England to raise funds to start it once more. I am glad to say that since leaving Australia I have heard from him, saying that he has a third time started again in the same place both mission and hospital, in spite of the eruption.



POINT FORMED BY LAVA-FLOW OF OCTOBER 16. PHOTO TAKEN FROM FORMER HIGH-WATER LINE LOOKING SEAWARDS.

A labour vessel from Queensland, which happened to be anchored here, had, as soon as the eruption commenced, sent their boats on shore in the hopes of getting plenty of recruits anxious to get away from the dangers that threatened them; however, they only succeeded in obtaining two. The natives said, "Me no want go along Queensland; me fellow got man war." One of the men in the labour vessel's boats remarked to our boat that we had served them a nice little trick; but my own opinion was, that recruiting under such circumstances, when the natives were all in terror of their lives, was, to say the least of it, a rather low-down game, and I took care afterwards to make certain that the two men they did get were really willing to go. We took our eighty natives to Rannon, near the north-west point of the island, a place of comparative safety and clear of the thickly falling dust, and the same evening comfortably housed them in a small schoolhouse belonging to Dr. Lamb, where they

remained until four days after, when we took them back again to their homes when all immediate danger appeared to be over. They were exceedingly grateful to us, and seemed very pleased to be once more at home, although their houses and all around were covered with a thick covering of dust.

On repassing the scene of the morning's outflow of lava, it was seen to have apparently stopped flowing, a fan-shaped point having formed out for some 200 yards into deep water, still steaming. All along the shore the water was of a light green colour like shoal water, and quite warm. A great quantity of dead fish and turtle were floating about, evidently killed by the hot water and violent submarine explosions.

On shore at Rannon the next day (October 17) earthquake shocks were occurring about every ten minutes, sufficiently strong to produce a very uncomfortable feeling of insecurity when seated in M. Rossi's house, a French trader that lived there. During the day they became so violent that towards the evening he embarked all his people on board his cutter and proceeded to Port Sandwich for safety. We steamed round the island to the eastward, and as we proceeded along the coast numerous fires were lit on the beach, the recognized signal in the Pacific for natives wishing to communicate with a ship; but landing here on the weather side of the island was next to impossible, and as there appeared to be no immediate danger, I did not stop.

Whilst steaming along the south coast, another dense cerebreform mass of cloud rose up perpendicularly over Benbow to a height of close on 15,000 feet, similar to what we had seen on the morning before.

We visited Dip point again, but the natives appeared quite reassured; "Fire he finish," they said, the possibility of further outbreaks never entering their heads, and the minor discomforts of earthquake shocks and a heavy coating of fine dust over everything not appearing to trouble them much. Dust was falling continuously, and was very distressing to the eyes, etc.; objects were not visible over a quarter of a mile, and we were very glad when we got out of it on our way to Port Sandwich for the night, but it was not until 9 miles to the westward of Dip point that we ran into daylight again, and rigged the steam hose and had a good wash down of everything and everybody fore and aft.

On the way across several earthquake shocks were felt on board, and during the night whilst at anchor about thirty were counted between 10 p.m. and 6 a.m., one about 2 a.m. being sufficiently severe to wake all hands up, tired as we were. The shocks continued more or less for three weeks afterwards, being felt all over the group, and we soon got quite used to them.

A heavy pall of dust and smoke now constantly overhung the island and drifted up the coast before the south-east trade, dust falling at Vao island, 50 miles off, the day after the outbreak, and in Santo, 80 miles distant, five days after, thick enough to cover the trees. Dense clouds-

of smoke and dust were constantly welling up from the crater of Benbow, attaining altitudes of from 10,000 to 15,000 feet, and on one occasion, whilst lying at Port Sandwich, some 25 miles distant from the crater, we saw an unusually great mass of dark-coloured smoke rising rapidly over Ambrym; in the course of about ten minutes it had attained an altitude of 26,000 feet, when a small perfectly white cloud of steam issued from the summit of it and quickly faded away, the whole mass assuming a modified "pine-tree" form, and spreading as a pall of inky blackness up the coast of Malekula. This, we found out afterwards, was evidently caused by a fresh outbreak from the crater when a second vent was opened up.

No rain fell for nearly a month after the outbreak on the western half of the island, *i.e.* to leeward of the crater, though frequent heavy showers were felt at Rannon and to windward. Dust fell continuously, and in consequence this end of the island changed from its natural hue of bright green tropical vegetation to one uniform light slate colour; the sides of Benbow and Marum looked, with the sun on them, as if snow-clad, and the cliffs at Dip point showed from Port Sandwich as white as the cliffs of Dover. The whitewashed marks we had made along the coast for surveying purposes disappeared in the general greyness, the weight of the dust caused the trees to droop, and the whole country looked as if a great blight had fallen on it. A certain amount of damage was done to the fruit trees, *i.e.* cocoanuts, yams, bread-fruit, etc., which were only just beginning to recover from the effects of the great hurricane of 1893, and on which the natives depend for their food-supply. However, about the middle of November a cyclonic disturbance set in, with heavy weather and abundance of rain, and the island once more resumed its normal bright green appearance, the dust all mixed with the soil or turned into a layer of stiff mud.

We paid constant visits to the island, and as far as possible visited all the points of interest connected with the eruption. A climb to the top of Single Palm hill near Dip point, one day when the wind happened to be from the northward, enabled us to get a good view of what had happened in this part of the island. A stream of lava had come from the direction of Fo-luk, its course being easily followed by the numerous vents of steam right away up into the hills, which looked bare and burnt, with steam rising from their summits, as if the lava had come over them. Almost directly under us, where the ground was fairly flat, the lava had spread out until it formed a lake nearly a mile in diameter, with an occasional small hill rising up like an island in its midst. The surface was being constantly travelled by small whirlwinds of dust rising to a considerable height, and at first sight looking like distinct "fumaroles," until, on watching closely, they could be seen to be rapidly moving. From the west side of the lake two streams led off towards Craig cove, and these we visited on two occasions. Landing

at the mission on October 20, everything was found to be covered with a deposit of dust nearly an inch thick, of a dull grey slate colour, the trees all drooping with the weight of it, and much of the undergrowth broken down. A number of natives accompanied us, and it was curious to observe the different effects of the dust, our party gradually turning black, and the natives white, until all were of the same sombre hue, a fact which hugely delighted the natives. This dull grey covering and the general disconsolate look of the dense bush produced a scene of the utmost desolation, which became intensified as the neighbourhood of the lava streams was approached. Occasionally small parties of natives were met, all of the same grey colour, some pursuing their ordinary occupations in their gardens as if nothing had happened, others carrying their household goods on their backs, and sometimes even the plaited palm-leaves that form the roof of their huts, moving house to a safer spot.

Presently a very excited conversation took place between our natives and two women we met, and evidently something unusual was up; but we were, nevertheless, a little startled, on turning a sharp corner of the narrow path, to see an advancing stream of red-hot lava, some 10 feet high, blocking up the road. However, it was only moving some 5 or 6 feet an hour, and consisted of great rough lumps of clinker, which every now and again fell over down the advancing slope, the lower portion being red hot and in a semi-fluid condition. Only the bush in the immediate vicinity was on fire.

We retraced our steps a short distance, and then by another path reached what was apparently the main stream; this had stopped short in its advance in the middle of a banana garden. At one place the wall of lava, some 30 feet high, was actually touching a large banyan tree, but had not burnt it. The lava was comparatively cool, but still too hot to walk on more than a few feet from the edge. It was tremendously broken up into rugged heaps of slag and clinker, and thickly covered with dull grey dust. A few days later we paid a second visit somewhere near the same spot, and walked on the flow for some 200 yards, but in about ten minutes were only too glad to get off again, our boots being nearly red-hot. Down many of the fissures could be seen the still molten lava a few feet below. Curious masses like broken water-pipes were lying about, some 2 to 3 feet in diameter, and 3 to 4 inches thick, smooth inside and out; these proved to be the broken-off chimneys of the "fumaroles" or vents for the escape of vapour leading down to the molten lava below. That they were vent-holes for vapour I had practical experience, being nearly knocked head over heels by a sudden red-hot stifling puff that came up while looking down one of them. Trunks of trees were lying about on the surface, and one large tree still stood in the middle of the stream, with the lava piled up on the weather side of it, as well as lumps lodged in the forks of the branches; the trunk was charred in for about

a foot. We returned to the ship dirtier than the blackest chimney-sweeps, to find the dust falling heavier than ever, and the ship herself a dull grey mass from truck to water-line, the decks being covered with a deposit nearly a quarter of an inch thick.

The next expedition was to view the actual crater of Benbow. I had already, before the eruption, paid a visit to the centre of the island, curious to see what was behind the range of coast hills, and, after a long climb up over 2000 feet through the dense bush, was surprised, on descending 100 feet or so the other side, to suddenly emerge into the daylight on to a dry river-bed of hard ash some 200 yards

VIEW FROM (A)* LOOKING TOWARDS CRATER.

wide, which led to a great plain of ashes, bare of all vegetation except a few scanty shrubs in places, 5 or 6 miles in diameter, at an elevation of about 2000 feet, in the middle of the island, from the centre rising Marum and Benbow—both, as we afterwards found out, containing huge craters. This visit, curiously enough, was less than thirty hours before the actual eruption commenced, and gave rise to a story among the natives that I had set fire to the island, or, as they said, "Captain man war put mashes (matches) along ground and make fire."

On October 23 a party, consisting of Lieutenants Dawson and Marescaux, Mr. Bracey (boatswain), six men, and myself, landed about 2 miles to the westward of Rannon, and, after considerable difficulty, induced some ten or twelve natives to accompany us. On reaching the dry river-bed, we met with the first signs of the effects of the earthquake shocks: large portions of a cliff, where the river made a sudden

* See Map, p. 656.

fall of 70 feet, had fallen down, as well as numerous slips in the nearly perpendicular banks. On arriving on the plain, a bitterly cold shower of rain drenched us to the skin, and made the ground very greasy and difficult to walk on. As we skirted the slopes of Marum, it began to be much broken up by deep ravines into ridges of loose ash-hills 100 to 200 feet high, up which we had to climb, often on hands and knees, the ash giving way at every step, and then slide down the other side at a great rate, frequently having to retrace our steps and make long détours to find leveller walking.

Eventually a small summit (marked A on plan) was reached, with a post fixed on the top, evidently a landmark of the natives.

VIEW FROM (A)* LOOKING OVER THE GREAT ASH PLAIN TO THE NORTH-WEST.

From here a good view was obtained towards the crater some 2 miles away, the dense clouds of smoke rising from it forming a grand sight at this distance. All around, the loose ash-hills had been simply shaken to pieces by the earthquakes, and the scanty coarse vegetation growing on them was nearly buried out of sight; great cracks traversed the ridges, and they appeared almost too unsafe to venture on. From what we had already experienced, it seemed nearly hopeless to expect to cross the endless succession of ash-hills that lay before us. The natives now declared there was no road, and refused to go any further. However, when they saw we were determined to push on, three out of the number followed us, and soon discovered the road. After climbing a few more razor-back ridges, a gully was hit off leading in the right direction, and, with one or two checks,

* See Map, p. 656.

this led right up to the crater; the ground became firmer and better walking, and the noise of eruption nearer and nearer, until, after a most fatiguing tramp of over six hours, a final scramble along a narrow knife-edge of ash, with an almost perpendicular descent on either side of about 200 feet, landed us on the actual lip of the crater.

The sight that met our gaze was ample reward for all the fatigue and trouble we had undergone. The crater was nearly a mile in diameter, with almost perpendicular sides ranging in depth from 800 feet under where we sat to about 1700 feet under Benbow summit, the actual floor of the crater being quite flat, of cooled lava, and about the same level as that of the great ash plain outside. It was thickly covered with snow-white ash and dust, as well as the walls of the crater all round, from which with each fresh concussion it kept falling in huge landslips. On the further

VIEW OF BENBOW CRATER, LOOKING TO THE SOUTHWARD.
The figures on the lip of the crater are at position marked B on plan.

side of the bottom of the crater was a great hole or vent, almost completely obscured by the dense volumes of smoke issuing from it, which rose some 2000 to 3000 feet above our heads; the dust all round it kept slipping down into the depths below, only to be shot up again among the smoke. Every two or three minutes a fresh explosion would take place and stones be thrown up, making a strange crackling noise as they hurtled together in the air. No outlet could be seen for the escape of lava from the crater anywhere. Owing to shortness of time, we had to start back again after a stay of only half an hour, and, as it was, were overtaken by the darkness, feeling our way at a snail's pace for the last mile through the bush, carefully guided by a native, who seemed to intuitively find his way through the pitch darkness under the trees. We followed in Indian file, and his warning cries of "Stick along ahead," "Stick along ground," were passed from one to the other along our long line, and saved us many a nasty knock. Finally, we reached the boat about 8 p.m., after a most fatiguing tramp under a tropical sun of quite 30 miles, the

greater part over loose ashes, and suffering much from want of water. A bathe, however, in the hot springs on the beach made us feel ready to commence the ascent again. A month later, in company with Lieut.-Commander Cuddy and a party from H.M.S. *Karrakatta*, a second visit was paid to the crater. This time, knowing the road, the crater was reached in better time, and allowed of a longer stay there. The sight was even finer than on the former occasion. A new and much larger vent had opened up (probably when from Port Sandwich we saw the sudden burst-up of smoke to the height of 26,000 feet), dense volumes of black smoke were issuing from this new vent, whilst only steam or light-coloured smoke came from the old one, though only a few yards separated the two. At times, as the smoke cleared for a moment, we could see for a considerable distance down this new vent, which appeared to be more in the form of a fissure than a hole. Far down below in the bowels of the earth could be heard a roaring like a heavy surf beating on the shore; this would gradually increase in sound as each fresh explosion slowly mounted up the hole, dense volumes of thick black smoke welling out, with volleys of stones rising up above the smoke and describing beautiful parabolas in the air as they mounted up almost on to a level with where we were seated, their paths often marked by a trail of light-coloured smoke like rockets, then falling back into the hole or on to the ash at the sides, and occasionally into a pool of water that had collected after the heavy rains since our first visit, always with a sharp explosion and emission of steam, showing that they must have been nearly red-hot. The crackling of the stones as they struck one another in the air was like a constant heavy roll of musketry-fire, with occasional louder reports and echoes back from the walls of the crater, until it sounded as if a general engagement was taking place. It was altogether a sight and sound hard to equal in grandeur of effect, and most fascinating to watch. The ground where we sat was in a state of constant tremor, with occasional rather severe shocks. Shortly before we left the explosions increased very much in rapidity and violence, the smoke rose to an enormous height above our heads, and, owing most likely to a slight shift of wind, gradually filled the whole crater right up to where we were—and, in fact, it appeared high time to be off.

Many of the party had already started, making a bee-line for a water-hole 5 miles distant that on this occasion we had discovered at the edge of the ash plain on our way up. Curiously enough, the natives, who usually go all day without food or drink, even on such arduous expeditions, seemed unable to resist the temptation of the water on this occasion, and from that moment became slaves to drink and quite useless, frequently losing the path on the way back, and dropping to the rear with fatigue, and we had some difficulty in keeping them up at all. By doubling down all the last part of the descent, we just saved daylight this time, and reached the boats about seven o'clock.

Lieut. Dawson and a small party had in the morning separated from us on reaching the ash plain, and branched off to explore the eastern slopes of Marum, where, from the ship when off the east coast of the island a few days before, we had seen steam rising. After a laborious climb on hands and knees up the steep slopes of loose ashes, he reached the lip of Marum crater (marked C on plan), which he found of much the same size and shape as that of Benbow, only quite extinct. So steep and dangerous-looking was the edge of the crater, which was composed of ashes and stones that kept falling in small landslips, that it could only be approached near enough to look down by lying flat on his face, while the remainder of the party held on to his legs. At the eastern end of the crater was a broken lip with another small crater outside it, from which steam was rising. This small crater was visited in 1883 by Lieut. Beresford and a party from H.M.S. *Dart*, who ascended from Port Vato on the south side of the island, and *en route* looked into the crater of Benbow, which was then partially filled up with ashes, sand, etc., and looked as if it had been extinct for a very long time. An account of their expedition appears in the *Proceedings* of the Royal Geographical Society for 1884. Lieut. Dawson's party passed down the hill an hour before us, leaving a notice to that effect stuck up in the path; but they had, unfortunately, to part with their natives at the last village, about a mile from the shore, and lost their way—an easy matter in the dense bush—and eventually, when darkness overtook them, had to spend the night where they were without food or water, a very trying experience after the fatigues of the day. They were picked up at daylight the next morning, and luckily no after ill effects were felt.

Besides visiting the actual outflow of the lava into the sea, we paid two visits to the neighbourhood of the village of Fo-luk, from where the lava stream was reported to have come. Just before reaching it we crossed a deep gulley, down which a lava stream had flowed; the high line of the banks was quite 50 feet above the present level, the surface of which was concave in shape, the stream having been apparently drained dry, so to speak. It was still hot and steaming in places, and the natives had constructed a sort of "corduroy road" over it of sticks to save their bare feet. The hillsides were covered with cinders and dust to a depth of 6 inches. A small ravine that led up to the village of Fo-luk was full of lava up to the head of it, 100 feet above the main stream. The huts, as well as all the trees round, had been burnt, and were now thickly covered with ash; confused masses of lava were scattered about, with numerous big blowholes of steam some 30 feet deep. Several tree-trunks were still standing in the midst of the lava, the branches thickly clogged with dripping lumps of it, seemingly without being burnt much. Under one of the trees two women and two small children had been overtaken by the lava and buried beneath it—the only loss of life on the occasion, strange to say, the remainder

having managed to run away in time. The natives declared the lava had all come from somewhere further up the gulley, through the air "all same pigeon," a theory that seemed rather improbable, and we eventually found that it had actually burst out of the ground in this vicinity.

After a walk along the ridge on the south side of the gulley to a higher summit 200 feet above the level of the lava-stream, a good view was obtained looking up the ravine. The sides of the hills were perfectly bare, every vestige of vegetation having been burnt, and only a few tree-stumps lying about, and the dust and cinders covering the ground from 2 to 2½ feet thick. All was chaos and desolation; lava and cinders were heaped up in all directions, reaching in places nearly 300 feet up the hillsides; and on the top of the hill where we were standing, good-sized fragments some 3 feet in diameter were lying about—the "pigeons" of the natives. In the centre of the lava-stream was a hill of solid lava nearly 200 feet high. Steam was issuing in places all over the hillsides, which had caused us to think, when viewing it at a distance from Single Palm hill, that the lava had flowed over the hills. There was no regular crater, and it was evident that the lava had burst up from the ground in all directions, and had been either violently impelled up the hillsides by hydrostatic pressure, or else the hillsides had been themselves split open.

On the other side of the gulley we were able to get right up to the head of the outburst. Part of the ridge we walked along had been overflowed by a mass of clinker, which was still very hot, with deep cracks running through it in the direction of the ridge, down which solid lava or clinker could be seen for at least 15 feet. It was some considerable time before the natives with us could be induced to cross this, which was not to be wondered at, considering how hot the ground must have been to their bare feet, and how dangerous it looked. The head of the gulley was at length reached, and a small watershed, so to speak, found to distinctly separate this outbreak from a similar though smaller one on the opposite side. From the former had originated the stream flowing west that spread out into the lake under Single Palm hill; from the latter flowed a well-defined stream some 30 yards wide in the direction of the sea to the northward. About a quarter of a mile down it there joined another stream coming from the eastward, and the two combined had formed the one we had seen enter the sea on the morning of October 16.

We followed up the bed of this latter stream for about a mile; it was very rough and broken up, still hot and steaming in places, with pools of hot water tasting strongly of sulphur. Occasionally a swiftly rushing stream of water could be distinctly heard, running apparently only just under our feet—evidently the drainage after the heavy rains that had lately taken place flowing down the hollow left in the lava-stream when the more fluid central portion had flowed away (*vide*

Judd on 'Volcanoes,' p. 111). The lava-stream was comparatively narrow—only about 10 feet wide in places—and, as it wound through the hills, we expected at each sharp turn to come to the head of it; but it shortly straightened out and became wider, leading right away to the eastward. By climbing up a high tree, its course could be traced for some considerable distance, right up to a curious V-shaped aperture some 2 miles to the west-north-west of Benbow crater, amidst a bare, volcanic-looking mass of hills. It is from this spot that I believe the flow to have originated, but, unfortunately, it was too far off to visit.

I may as well mention here the rather ingenious account by the natives of the formation of the two distinct lava-streams, viz. that one stream had flowed down to the sea to the northward, and, having "kai-kai'd (eaten) all the salt water," had flowed back again and gone down the other way to the eastward.

The natives altogether seemed to be less affected by the eruption than one would have imagined; although extremely terrified as long as the actual outbursts were taking place, they appeared to have little fear as soon as they were over. "Fire he finish," they said, and seemed perfectly contented to resume their ordinary occupations, quite undisturbed by the dust and scene of desolation around them, and with an utter disregard for the possible events of the morrow, due to a blissful ignorance. With the exception of some of the more enlightened natives belonging to Dr. Lamb's mission, who seemed to understand that the eruption was due to no human agency, most of them had some story or other to account for it, such as the following: "Two chiefs, living on opposite sides of the island, quarrelled, as frequently happens, about a woman. One said, 'Very good, s'pose you take Mary belong me, me fellow make fire along you;' to which the other replied, 'S'pose you put fire along my place, you must pay pig.' This is supposed to have been done, and the pigs thrown into the fire to stop it—first of all small pigs, which the fire spat out again as of not sufficient value, and lastly big tusked pigs, which had the desired effect, and caused the cessation of the actual lava-flow, and both parties were satisfied. The subsequent fate of the woman, who had caused all the trouble, was not stated."

Our time being limited, H.M.S. *Dart* left for Sydney at the end of November, just six weeks after the eruption commenced, the crater still belching forth dense volumes of smoke with undiminished activity. Since leaving, the French man-of-war *Scorff* reports seeing Volcano, a crater near the south-east point of the island and which was active in 1888, at the end of December (1894) in a state of eruption, smoking heavily with a red glare over it, the side of the crater having burst out to the southward, and a lava-stream run down that way.

A trader at Dip point reports a second eruption having occurred on the north side of Ambrym in February (1895)—no lava-stream, but

a stream of hot, black, thick sulphurous water lasting from 6 a.m. to 5 p.m., accompanied with earthquake shocks; the smoke from Benbow crater still continuing undiminished, and the natives still throwing in pigs to stop it, with every prospect of denuding the island entirely of them if the eruption went on much longer.

There remains an ample and most interesting field for future exploration, which would more than repay the labours of any scientist who hereafter visits this locality; but much time is required to be spent over it, owing to the great fatigue experienced in the necessarily long and rough walks in a most trying, hot, moist climate, often without the possibility of procuring water, entailing a thorough rest of some days between each successive expedition.

What the next event may be in that vicinity it is impossible to forecast, and perhaps all that I have just related may fall into comparative insignificance with the next outbreak, as in the case of Krakatoa in 1883.

Before the reading of the paper, the PRESIDENT said: We receive from the hydrographer to the Admiralty a detailed report from year to year on the work done by the naval surveyors. But we rejoice when we are able to welcome one of those surveyors in person. Captain Purey-Cust, when surveying in H.M.S. *Dart*, was a witness of a most extraordinary eruption at Ambrym, an island of the New Hebrides, an account of which he will now give to us.

After the reading of the paper, the PRESIDENT said: We were going to have an animated discussion on this paper, but I am afraid that those who intended to address the meeting have gone to the Queen's Concert. I do not see the hydrographer, who appears to have left us. Lord Stanmore has also gone to the Queen's Concert, and Sir Henry Norman. One or two geologists of eminence intended to be present this evening, and, in their absence, I will ask if any one else wishes to speak. If not, I will merely say that we are very much obliged for papers of this kind relating to the volcanoes which occur along this marvellous fissure running south-west and north-east, extending almost to Krakatoa. The more we know of them, and the more details we obtain regarding their nature, and the periods of eruption, the more likely are we some day to come to a knowledge of the causes of these fearful devastations in the New Hebrides and elsewhere along that line of volcanic activity. I trust that naval surveyors will often favour us with papers, and become Fellows of our Society. You will all, I am sure, desire me to express to Captain Cust your cordial thanks for the very interesting paper he has read to us this evening, and for showing us so many interesting views on the screen.

THE BONDE COUNTRY, EAST AFRICA.*

By the Rev. H. W. WOODWARD.

THE accompanying map was made to illustrate the work of the Universities Mission in that part of East Africa known as Ushambala and Bonde (more correctly Boonde, but that leads to its being miscalled

* Map, p. 656.

Bunde). It includes part of the most westerly range of Ushambala mountains, and the Bonde country which lies between them and the wilderness. The northern limit is the river Zigi, beyond which the people are Washambala, and the southern limit is the Luvu, but there are many Zigua villages north of it.

The map has been made by the aid of the prismatic compass only. The foundation of it was the triangle formed by Kitulwe peak, Magila mission station, and the highest point of the low hill east of Magila, and larger ones including Mlinga, Kitulwe, and Magila peaks, Umba, and Kiguluni hill. The rest was filled in by bearings taken to and from these points wherever possible. The scale is approximate only. The variation of the compass was taken at 10° exactly for convenience. The whole was worked out very carefully, and frequent visits in the course of duty enabled me to take the chief bearings more than once. When I had tested them many times, and felt sure that Magila and Umba were in their true relative positions, I divided the space between them into eight, taking each division as a mile. Mr. Keith Johnston, who visited the country in 1879, fixed the positions, I believe, of both Magila and Umba, and he told me that the distance between them as the crow flies was exactly 8 miles. Many little brooks exist which I have not traced. The principal rivers are the Luvu and the Zigi; smaller ones are the Kihuhwi and the Maluka, tributaries of the Zigi and the Ukumbine.

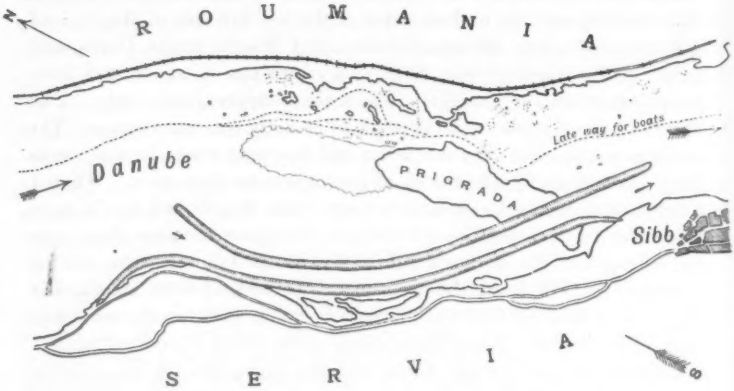
Descriptions of the country will be found in the *R.G.S. Proceedings*, vol. i., New Series, by Rev. J. F. Farler; and p. 545, Mr. Keith Johnston's own account of his journey, together with a paper on the geology of the country by Mr. Thomson. This country is now in the German sphere of influence, and there are already promising plantations of tobacco and coffee, and a railway has been commenced from Tanga, which is to go *viâ* Sega and Kologwe to Kilimanjaro.

THE REGULATION OF THE IRON GATES.

By Dr. K. PEUCKER, Vienna.

We have already, from time to time, noticed the progress of the great engineering works begun in 1890 at the Iron Gates, with the view of opening the upper Danube to navigation by vessels of considerable size. The expectation that the works would be practically complete by the end of 1895 has been justified, and the formal opening of the channel took place on September 27 last, in the presence of the Emperor Francis Joseph and many princes of neighbouring states. The main object of the works was to clear the stretch of some 50 miles of the rapids and shallows obstructing it, and especially to cut a clear channel 200 feet wide and 10 feet deep through five dykes crossing the bed of the river (Fig. 1), consisting of hard rock, which had to be blasted with

dynamite. The first ridge was at Stenka, where 2800 feet had to be cut through under water; and 10 miles lower down the Kozla Dojke barrier was pierced by a canal following the course of the river for about a mile. Five miles further on the Izlaz-Tachtalia rocks presented a whole series of obstacles, which were circumvented by the construction of a canal and the erection of a dam, giving the Danube a new



right bank for a distance of 4 miles, and narrowing its bed from 6500 feet to 1000 feet. The Jucz cataract is also overcome by a dam 2 miles long. At the last and largest rock shoal, the Iron Gate properly so called (Fig. 2), it was not deemed advisable to open a clear channel

on account of the strength of the stream, and a canal was accordingly cut round it.

To avoid interference with traffic during the five years the works were in progress, it was necessary to operate on the bank opposite to the old channel, *i.e.* the right or Servian bank, and the erection of dams

and the blasting work were done at low water, when the rock was exposed. On the Prigrada bank the workmen discovered remains of two immense unfinished dams, erected by Trajan to confine the waters of a canal. Here the new dam next the river is 130 feet wide at its base, 13 feet wide at top, and is composed of blocks of about $1\frac{1}{3}$ cubic yard contents. The dam on the landward side is really built in the river-bed, but is supported by an embankment which brings it into contact with the former Servian bank. Both dams are 7200 feet long, and the channel they enclose is 260 feet wide at low water; the bottom is black limestone throughout.

At Orsova there is a deep channel for the larger barges of the lower Danube, where these can discharge into vessels of lighter draught. There remain a few obstacles below the Iron Gates, which it is hoped will be removed by the end of 1898, and when these later works are completed the channel will at last be wholly clear from Moldeva to Turn Severin.

AN ATTEMPT TO RECONSTRUCT THE MAPS USED BY HERODOTUS.*

By JOHN L. MYRES, M.A.

The Problem. To visualize the geographical passages in accordance with the principles of geographical interpretation which they assume.

The character of the passages—
- (*a*) Descriptive.
- (*b*) Schematic. (1) Lines; (2) Areas.

N.B.—Lines are—(*a*) Meridional. (*b*) Equatorial.
- (*c*) The principle of symmetry.
- (*d*) The doctrine of three continents.

The growth and method of early Greek map-making.
- Route-maps, ancient and modern.

The Ionian Map.
- A sixth-century Ionian map. Aristagoras.
- Herodotus knows of variants.
- Development of the Ionian map.
- The history of the equatorial axis.
- A crucial instance. Italy and Scythia. Nile and Ister.

The Persian Map.
- The column of nationalities.
- The two promontories.
- The equator of Tyre and Ecbatana.
- The river of India.
- Did Skylax edit the Persian map?

Explanation of the Ionian inaccuracy in the North.

Explanation of the Persian inaccuracy in the South.

The doctrine of three continents.
- Its history and development.
- The Phasis-Tanais controversy.
- The Scythian square.
- Cosmography distorts topography.

The twofold plotting of the royal road.

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* Paper read at the Royal Geographical Society, March 16, 1896.

One of the principal and most obvious difficulties, which the 'History of Herodotus' presents to the student, is occasioned by the fact that the work was planned with a breadth of conception and an amplitude of detail, which far outran the limits of literary form prescribed by the circumstances of the time. It is difficult to depict fully the advantage which a modern has over an ancient author in the superior mechanism at his command for the systematic, and particularly for what may be called the graphic, arrangement of his subject-matter. The elasticity of the diagramatic scheme which is supplied by the printed page; the accuracy with which parenthetic, explanatory, and confirmatory sections can be distinguished from, and subordinated to, the main thesis of an essay by differences of type; and the accommodation supplied by footnotes and appendices, render the exposition of a complex theme, and the proportion of its various parts incomparably easier, than when text, footnotes, appendices, illustrations, and atlas have to be arranged as consecutive or parenthetical paragraphs and periods of a roll of manuscript. This, however, is notoriously exactly what has happened in the case of Herodotus; and the suggestion may be ventured, whether a considerable service might not be rendered to our author by an "edition," in the modern sense, of his work, dissected into the elements just indicated, and printed as Herodotus himself would prepare it for the press, were he able to re-issue it himself in modern volume form.

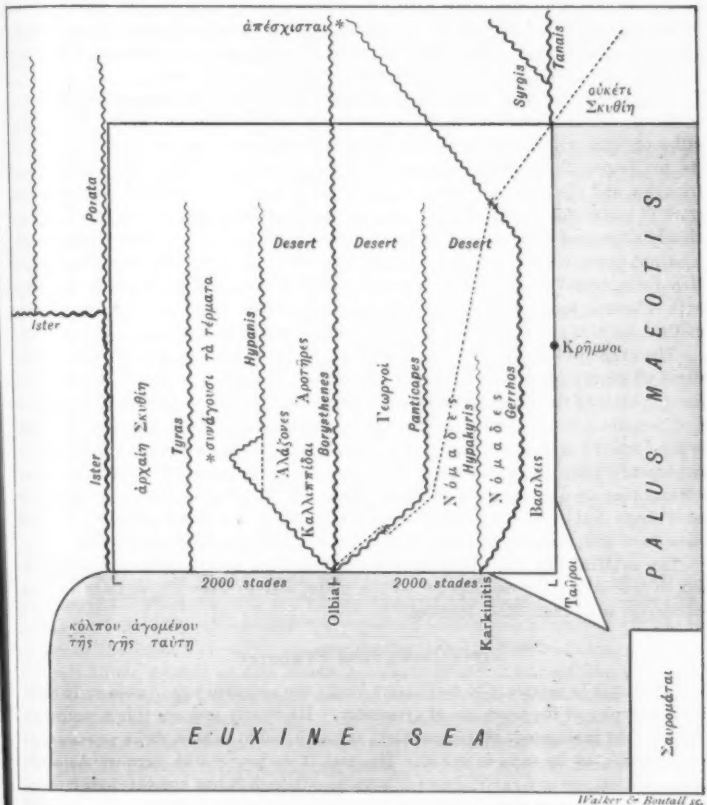
The present note is an attempt to realize only one department of such a scheme: to extract the passages which serve in place of the maps of Herodotus; to visualize them in accordance with what we can infer, from his work, to have been the current notions of map-making in his day; to trace the individual maps, so far as may be, to their several sources for different sections of his work; and to supply what explanation is possible of the geographical theories which they embody, and of their divergences from our presumably more scientifically constructed charts.

All previous criticism of the geographical statements of Herodotus has been more or less wholly content with pointing out their divergences from the real map; and it is time that the attempt were made to recover and state explicitly the principles, however erroneous, which underlie those statements, and to build up, however diagrammatically, the outlines of the "Formæ Orbis" which lay ready to the hand of Herodotus. Much of what follows will seem to rest upon a very slight foundation in ancient literature; but it will claim to have served its purpose so long as it is based upon the facts of the history of Greek commerce and adventure, and so long as it is borne out by those undesigned allusions in the narrative of Herodotus, which are so numerous, so artlessly insinuated into the story, and so difficult to harmonize with any ordinary map.

That depicted maps existed even before the time of Herodotus, is clear from his account of Aristagoras in E. 49, and from his graphic criticism of Hekataios and other nearly contemporary map-makers in B. 23 and 36; and is suggested by what he says of the current controversy about the three contingents Δ. 36, *ἐν ὀλίγοισι γὰρ ἐγὼ δηλόσω μέγεθός τε ἑκάστης αὐτέων καὶ οἵη τις ἐστὶ ἐς γραφὴν ἑκάστη*, and of the circumnavigation of Africa by the Phœnician expedition of Necho Δ. 42, and of southern Asia by Skylax of Karyanda Δ. 44; for the comparison which he institutes between the results of these two expeditions presupposes graphic means of representing the proportions and relations of land masses on a general map of the known world. We shall see that he was himself acquainted with more than one of these universal maps, and perhaps with more than one edition of one of them; and it is with these maps of the world that we shall be chiefly concerned.

The geographical passages in Herodotus fall into two classes: some give bald and diagrammatic outlines of the general features of well-defined geographical areas, and of their relations to one another; others give details of physical and

topographical features only. The latter are clearly intended to be plotted out upon a skeleton map constructed by means of the former. For example, the famous Scythian square (Δ. 99–101) is not intended as a literal word-sketch of the pictorial map lying before the writer, but only gives a series of construction lines like those of a trigonometrical survey, upon which the actual sea-coast, mountains,



SCYTHIA: A DIAGRAMMATIC MAP (HEROD. IV. 99 *ff.*).

The dotted line from Olbia to the mouth of the Tanais represents the route indicated by Herod. iv. 18–20, as follows: *Olbia*—[three days]—*Pantikapes* ford—[fourteen days. N.B.—No *Hypakyris* ford]—*Gerrhos* ford—[days not given]—*Tanais* ford—[Τάναϊν δὲ ποταμὸν διαβάντι οὐκέτι Σκυθίη: thence the route is given, Herod. iv. 21 ff.].

rivers, and tribal frontiers might be drawn in. *How* they were drawn in, we have to determine from indications scattered up and down the narrative.

The indications which Herodotus supplies of the general proportions of his maps are of two kinds. Sometimes he gives lists of place- or tribe-names which lie in the same direction across the map, and so indicates parallel or interlacing

lines, like the *memoria technica* of places of same longitude or latitude, in our school-books. For instance, the columns of names in Scythia (Δ. 17, 18, 19), between the Persian Gulf and the Euxine (Δ. 37), along the royal road (Ε. 49), or from the Nile westward at ten days' intervals acroes the Sahara (Δ. 181–4). A notable instance is the line from the mouth of the Nile, through the Cilician Gates and Sinope to the mouth of the Ister (Β. 34). Another—important because deflections in it are determined with care—is the north-eastern trade route across Russia (Δ. 21 ff.). Elsewhere he encloses the geographical areas in rectilinear boundaries, such as the Scythian square (Δ. 99–101), the rectangle which encloses Asia Minor (Δ. 37), and the parallel zones of Libya (Δ. 168–186).

The reason for this, at first sight, elementary method of map-making is fairly obvious. We moderns also divide up our maps into a series of parallel latitudinal strips of equal width, each subdivided transversely by the lines of longitude. And we too begin all important surveys by cutting up the country into a network of triangles, and plot out its features with reference to these. But the idea of a network of rectangles whose sides are parallel to a meridian and an equator was first clearly expressed only by Eratosthenes in the third century B.C., and triangulation does not come within our present field of view at all. In the word-sketches of Herodotus, however, we have certainly the germ of the system of fixing positions with reference to a meridian and an equator; and we shall see that use of this method led him and his contemporaries to important consequences.

The evidence for this early use of prime meridians is the otherwise inexplicable stress which is laid, in Herodotus (Β. 34), on the straight line which connects the lower courses of the Nile and Ister, *viâ* Sinope and the Cilician Gates; and again in Δ. 37, on the column of nationalities which extends from the southern or Red Sea to the northern or Euxine Sea. Their use, in the maps to which they belong, is as perpendiculars on the equator, by which the extreme northern and southern sections may be duly oriented and correlated. We shall see reason to believe that some maps had subsidiary meridians, parallel with the principal one; the best instance of which is the columns of tribal areas within the Scythian square.

The evidence for the equators is somewhat more complicated, and it will be best to proceed to the description of the maps, and to take the equator in close connection with their other features.

Inferences from Symmetry.

But first it is necessary to emphasize briefly the admitted importance in Herodotian geography of the postulate of symmetry. He clearly reckons this a legitimate and valuable instrument of geographical research, τοῖεσι ἐμφάσι τὰ μὴ γιγνωσκόμενα τεκμαιρόμενος, as he says in Β. 33. He uses it to prove that because Asia and Libya are circumnavigable, Europe is so too, though it has not yet been circumnavigated actually (Γ. 115) (Δ 36). In Β. 43 he goes further, and argues that because Libya and Asia are circumnavigable, and there is no continuous land as far or beyond the absolute south, therefore not only is Europe also circumnavigable, but the continuous land must stop short of the absolute north, and therefore he discredits the current legends of a Hyperborean country and people; that is, of continuous land up to and beyond the absolute north. It is, of course, understood that throughout early geography the north is not a point, but a *line*, as in Mercator's projection, or in any other "Flat-land."

Again, in Δ. 40 he assumes that the Caspian, as a part of the undiscovered "northern sea," corresponds with the known Red or "southern" sea, a conclusion which reappears in Eratosthenes, who, with greater precision, equates the Caspian with the Persian Gulf. It is true that this is inconsistent with Herodotus' own

statement in A. 203, where he describes the Caspian as a separate piece of water, and gives measurements of its length and breadth; but in that passage he is clearly using information derived from Milesian traders of Dioskurias or Trapezus, and incorporated with an Ionian map where the Caspian is equated with no southern sheet of water, and where the width of the land from north to south is taken to be very much greater than it is in the map which he follows in Δ. 40.

Best instance of all (B. 26, 33–4), he uses the known upper sections of the course of the Ister as evidence for the unexplored sections of the Nile, and the known lower course of the Nile to correct the empirical orientation of the corresponding section of the Ister; and builds an elaborate and important group of theories upon the symmetry thus obtained; and it is in this passage that he explicitly affirms his belief in the validity of the method which he employs.

Now, any symmetry of north and south is necessarily symmetrical about an east and west axis lying between them. Therefore, by plotting out all the instances of symmetry in Herodotus, so that the middle points between each pair of symmetricals are in the same straight line, we shall be able to identify the axial line of the map which he is describing. Now, all these instances of symmetry are symmetries of north and south, and consequently the medial line about which they are symmetrical must lie east and west; that is, the axis of his map is always an equatorial axis. The displacements of the real map which have to be effected in order to co-ordinate these axial points, will be a measure of the degree of distortion in one or another section of the ancient map. But if it is found that within any area the distortions are so violent that the map cannot be filled in, then we may suspect that our author means to indicate in the same area more than one set of axial points, and consequently more than one axis. And if it is further found that in the same or similar contexts the axial points are consistent, but that in different contexts they are inconsistent, then we may be allowed to inquire whether, to illustrate different parts of his history, Herodotus did not use different maps.

The Ionian Map and the Persian Map.

To anticipate the general result for a moment, we shall find that he uses two great maps, of which the one is a sailing chart of the Mediterranean, constructed on the meridian of Naukratis and Sinope, which is distorted north-westward to the mouth of the Ister, and on an equator passing through Sardis, Pteria, and Susa; we shall allude to this as the Ionian map, and justify the name hereafter. The other is a map of the Persian empire and adjacent countries, constructed on a meridian connecting the mouth of the Choaspes with that of the Phasis, and on an equator lying along the axis of the Levant (very nearly along the 34th parallel of latitude), passing through Cyprus, Crete, and Sicily as axial land masses, and produced eastwards through some Phœnician town, and probably through Ecbatana. These two maps overlap from the Archipelago to the lower Euphrates; they are, in this area, inconsistent with each other, and their inconsistency is mainly explained in principle by the fact that the Ionian map takes the Royal Road from the Euphrates to Susa as running east and west, whereas the Persian map takes it as running north and south.

To appreciate fully, however, the significance of the accuracies, and still more of the inaccuracies, of the map of Aristagoras (E. 49) and such other maps as we can identify, we shall do well to recapitulate briefly the genesis of Greek map-making from this point of view.

The Homeric poets display no small talent for topographical description, and there is at least one example of a description of a habitual route across the Archipelago and round Peloponnese (Od. iii. 172). But there is no framework at all

of the kind we have indicated, and consequently all attempts to construct a map of the remoter regions are foredoomed to failure; not to mention the fact that it is by no means clear that the successive adventures of Odysseus, for example, have any original connection with one another, or with the hero who relates them as his own.

On the other hand, the spread of Greek adventure, colonization, and commerce in the centuries succeeding the Homeric age could not but give occasion for the formulation of sailing directions, written or unwritten, for the principal lines of traffic. Now, it is above all things necessary to emphasize the fact that, not only in Greece, but universally, early maps originate in the pictorial representation of physical features as seen along a route by land or sea, and that the details which are subsequently determined are usually filled in to right or to left of the nearest such road. This principle of cartography may be most clearly and completely studied in the early maps of Japan, where, as for instance in the navigating chart reproduced in Siebold's 'Nippon,' Plate xxvi., the topography is plotted, on a sort of rectangular projection, on either side of a route from Nagasaki to Osaka, which is represented on the map with a series of very gentle curves; whereas on the real map it is very devious, and bends through nearly a right angle, first one way and then the other. The same is the case also with the maps of Saghalien in the same work, in which the coast-line is much simplified, the breadth of the island much exaggerated, and the bird's-eye view of the mountains regularly drawn to be looked at from a point of view over the nearest sea.

The Peutinger Table is a conspicuous instance nearer home. Here changes of direction in the itinerary are indicated by short bends, after which the route resumes its former course, so as to keep within the limits of a narrow roll of manuscript. Nor is the device extinct in more recent itineraries. Ogilby's road books have only this advantage over the preceding, that the angle of deflection is indicated by a compass mark; but the modern boating maps of the Thames, and the printed itinerary of the Great Western Railway, want even this simple corrective; while the maps which the South-Eastern Railway displays in its carriages are monumental instances of the distortions incidental to the representation of a route as axis of a peninsula [cf. The President's account of Paterson's road-map, *infra*].

Further, if a road forks, there is a strong tendency either to represent each branch as going off at an equal angle from the trunk road, or else to represent the straighter or more frequented as a continuation of the trunk, and so exaggerate the deflection of the by-path. Now, as soon as the moment arrives when an intelligent geographer attempts to represent two or three routes in different directions on the same diagram, the results of this tendency to straighten the road become a serious source of error, and unless the compiler shows distinct knowledge of a deflection, we are probably right in assuming that he transcribed the route as he found it in his authorities, approximately straight. This is, at all events, the practice of Herodotus; in Δ. 21 ff., when he is describing a route through South-West Russia which he knew to be curved, he marks, like the Peutinger Table and Ogilby's maps, the exact point at which each principal deflection occurs, by giving a new orientation for the next section of it. But in most cases he is content to give one orientation to begin with, and none further on. And in these cases we are entitled to draw the whole road in the same line, unless we can bring other evidence to show that he knew it to be curved—a case which does not seem to occur.

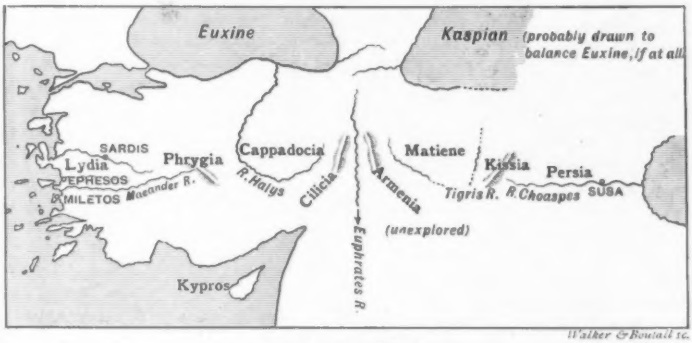
We have seen, from the text of Herodotus, that his own method and materials were very much of the kind thus indicated, and we may also see already, as in the case of Scythia, how much trustworthy and serviceable topography may be fitted into a

diagrammatic scheme which is grossly inaccurate, without seriously damaging the map for practical purposes.

In order, then, to recover the type of map which Herodotus may be supposed to have used, let us start simply with route-surveying, and the doctrine of symmetry, already described, as the principles of our geographical method; and the historical growth and extension of Greek enterprise as our data: develop, in accordance with them, the account preserved by Herodotus of an actual map in use shortly before his time; and check our results, wherever this is possible, by comparison with the geographical statements or allusions in the work of Herodotus.

The Ionian Map.

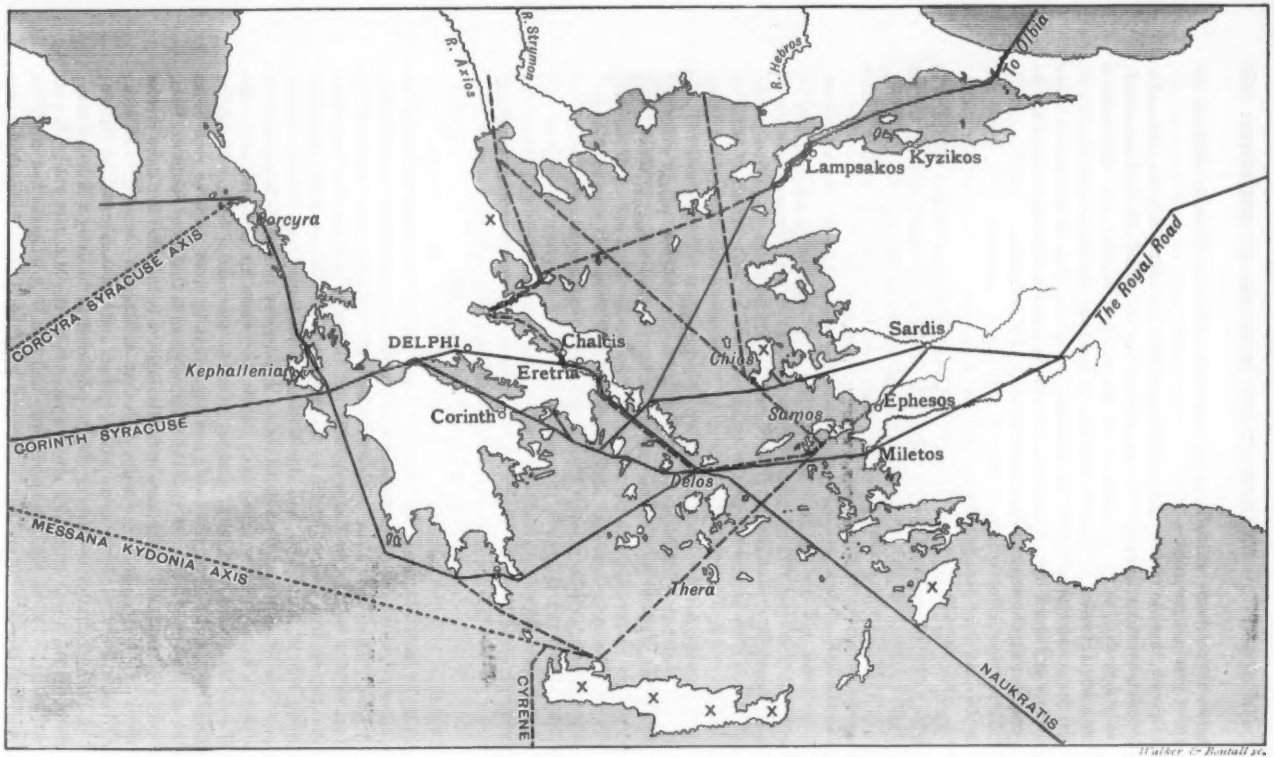
According to Herodotus (E. 49 ff.), Aristagoras of Miletos brought to Sparta in 501 B.C., a bronze engraved map of the circuit of the whole Earth, with all the sea and all the rivers; which, in his attempt to induce Sparta to attack the great king, he describes as follows: "The peoples I shall mention adjoin one another. Here



ARISTAGORAS. 501 B.C.

An earlier edition of the Ionian Map.

are the Lydians adjoining the Ionians; here are the Phrygians adjoining the Lydians on the east; the Kappadokians, whom we Ionians call the Syrians, adjoin the Phrygians. These have a common frontier with the Kilikians, who come down to this sea here, in which here lies Kypros." (In Cilicia he includes the population of the whole of the Tauros, as far as the Euphrates.) "Here are the Armenians adjoining the Kilikians here, and the Matienians inhabiting this district next to them. The Kissian country adjoins these; and here by this river Choaspes is the city of Susa here, where the great king dwells, and where his treasures are." He adds that Susa is three months' journey from the sea-coast of Ionia. Herodotus confirms this account from his own knowledge, that is, from maps or road-books extant in his time; but adds that the distance given is that from Sardis to Susa, and that the distance from Ephesos to Sardis ought to be included in a more precise estimate. Here Herodotus ignores the fact that Aristagoras comes from Miletos; that Greek maps were, so far as we know, earliest and best constructed at Miletos; and that consequently Aristagoras may be presumed to be using a Milesian map; that Miletos has a road of its own into the interior, up the Mæander valley, shorter and better than that by Ephesos and Sardis; and that if Aristagoras had meant to indicate the Hermos valley road, he could hardly have avoided mentioning the



Walker & Boutall sc.

REAL MAP, SHOWING THE PRINCIPAL GREEK SAILING ROUTES.

("Milesian;" "Samian;" [illegible])

existence of Sardis, and also the fact the expedition was not to start up country from its own town, but from Ephesos. Moreover, the emphatic introduction of the town Susa, and the river Choaspes as the objective of the expedition, is rhetorically and diagrammatically superfluous if it does not correspond to a town on a river understood at the start. Now, the only town and river which could be thus tacitly introduced by a Milesian speaker are Miletos itself, and its own route-valley of the Mæander. What Aristagoras means to indicate, as the outline of the campaign, is that Kleomenes will go up a river (the Mæander), cross a river (the Euphrates), and go down a river (the Choaspes), and then he will be at Susa, which faces the eastern sea, as Miletos faces the western.

Now, this symmetry of the Mæander and the Choaspes is itself faulty and superfluous, unless the royal road was depicted on the map of Aristagoras as crossing Asia from east to west in an approximately straight line. We have already seen instances of the universal method by which lines of route are combined into a general map; and it is clear from the words of Herodotus, "*all* the sea, and *all* the rivers," that this was such a map. We have seen, also, that changes of direction are only indicated where they are important for the guidance of the traveller; and the argument, though negative, is of some weight, that the absence of a re-orientation mark means that this route was regarded as straight by the draughtsman, if not also by the compiler. Now, Aristagoras begins by orienting his road πρὸς ἠὼ from Ionia, which is actually correct, and then leaves it alone. We may add the further argument that he is discussing the invasion of a land empire by an alliance of Greek states which would command the sea, and, as his object was to minimize the difficulties of the expedition, he would certainly have proposed to attack from the Syrian coast if he had had any suspicion that Susa lay so far south as it really does; that the Euphrates, though forded at mid-journey, reaches the sea within a few miles of the Choaspes; and that both this and the road itself could be reached by a comparatively short march from the coast opposite Cyprus.

In the succeeding chapters Herodotus volunteers a very much fuller account of this road, tabulated in the form of a road-book, and probably, in part at least, derived from one; but here again there is nothing whatever to indicate any change of direction in the road. Meanwhile it is clear that Herodotus himself is using an edition of map and road-book intended for the Ephesos-Sardis route. This is the route, not for Milesian, but for Samian trade, and since Herodotus shows himself otherwise peculiarly well acquainted with Samos, we shall probably not be far wrong if we assume that he is using a Samian map. In any case he is not using a Milesian map; so that we have evidence that there existed more than one variety of this group of maps and road-books; that these agreed from the Phrygian frontier eastwards; but that they were constructed on divergent road lines when they approached the Ionian coast.

Now, in all probability these divergences were continued seaward, firstly, by producing the road-axis itself, and secondly, by appending the maps and sailing directions of the westward sea-routes which originated in the respective termini of the land-roads. We are, consequently, justified in asking what conception of the rest of the Mediterranean is implied in, or at least is consistent with, the geographical scheme here presented, and for this purpose we must look back to a rather earlier stage of Greek geography. We see here that each of the great Ionian seaports probably had its own version of the type of map of Asia Minor here indicated, with the Royal Road as its axis, and detailed surveys plotted out north and south from one or other section of the royal road as a base-line. Now, the route-axis of the Milesian map of Aristagoras, which passes down the Mæander valley and through Miletos itself, follows, when produced westwards from Miletus, the

REAL MAP, SHOWING THE PRINCIPAL GREEK SAILING ROUTES.
"Miletus."

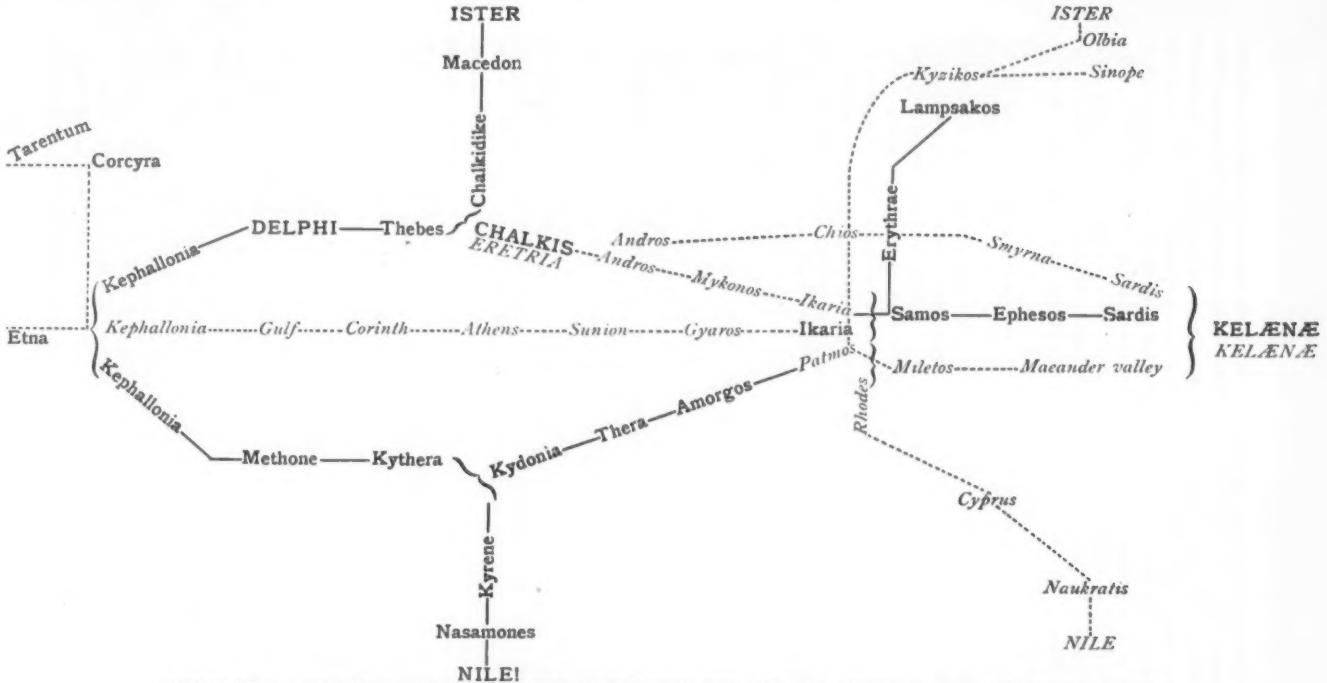


DIAGRAM OF THE PRINCIPAL GREEK SAILING ROUTES, ILLUSTRATING THEIR APPARENT SYMMETRY ABOUT AN EQUATORIAL AXIS.

Names in Roman type represent towns in commercial alliance with SAMOS and CHALKIS.
Names in Italic type represent towns in commercial alliance with MILETOS and ERETRIA.

main route through the Cyclades under the lee of the chain of islands which end in Eubœa. This line is actually curved, but, as in the case of the Royal Road, its curvature, being gradual, was easy to underestimate, especially if the ships followed then, as they follow now, the convex side of the curve, and consequently do not attain at any point a conspectus of the whole route. Now, the bulk of the trade of Miletos with Greece in the sixth century was consigned either to Eretria or to Athens, while some went on to Corinth. The ships for Eretria parted company with those for the Saronic gulf under Tenos. This fork would be naturally represented, as we have seen, as diverging on either side of an ideal production of the axial line, which would strike the mainland at Sunion, and run up the axis of Central Greece.

Again, Herodotus (A. 18, and other passages) proves that Chios was in commercial union with Miletos, but shares with its geographical neighbours a prolongation of the Hermos valley road through Sardis. Now, from Chios, Mount Ocha in Eubœa is visible on a clear day; consequently, Chian ships bound for Greece have no need to go round by Icaros and Tenos. This is one of the alternative routes recommended, for ships crossing the Ægean, in Od. iii. 172. The Chian axis of the Ægean, therefore, goes straight across, and this is, moreover, actually a continuation of the line of the last section of the mainland road, Sardis—Smyrna—Erythræ. Now, the Chian axis, produced into Central Greece, actually cuts the Milesian axis in the mountain mass of Parnassos, namely, at Delphi, the ὄμφαλος γῆς of early Greek universal geography. The actual latitude or heliacal orientation axes both of Eretria and of Chalcis meet it at the same point.

Now, the geographical reason why Delphi is the ὄμφαλος γῆς is twofold. First, the Delphian theory that the extreme east and extreme west are equidistant thence, which is probably itself a deduction from obvious empirical data; second, that both the observed and the theoretical divisions between the three continents meet there. These divisions, as we shall see, are the following: between Libya and Europe, the axis of the Mediterranean from between the pillars of Herakles through the central island Sicily; between Europe and Asia, the axis of the Hellespont and the Bosphoros; and between Asia and Libya, the axis of the Arabian gulf, which, when produced into the Mediterranean, coincides with the direct route to Egypt *viâ* Rhodes; all three, when produced, meet on the side of Central Greece which faces the Corinthian gulf. The conspicuous mountain-peaks of Parnassos and the world-renowned pilgrim shrine of Delphi combined in the sixth and seventh centuries to fix the exact spot beyond question. Now, the axis of the Western Mediterranean, if produced to Delphi, almost exactly coincides in reality with the heliacally determined equator of Delphi itself, and the Chian and Eretrian axis already referred to; and the alternative Milesian axis of the archipelago rectifies itself at the same point. What more natural than that the common axis of the Ægean, of Central Greece, and of the Western Mediterranean should be taken by the map-makers of the Milesian league (let us say at once by Thales and Anaximandros) as a natural, or, as we should say, providential continuation of the axis of the Royal Road?

The Samian line of traffic with Greece follows the same course as the Milesian, under Icaros and the chain of islands, its objective being Chalcis, and to some extent Corinth. But Chalcis and Samos are also the earliest and most important of Greek navigators in the west, and the westward-bound Samian ships went by Patmos, Amorgos, Thera, Kydonia, and the Kythera channel. Here they divide, some going southward to Kyrene and Egypt, but the majority to Sicily. This latter involves a considerable change of course to the westward; but as no boat left the coast of Peloponnese, except by accident, before reaching Kephallenia, and

Names in Roman type represent towns in commercial alliance with SAMOS and CHALCIS.
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as the majority followed Eretria and Corinth, and made the longer, but safer, detour by Corcyra and Tarentum, there was no means of estimating the total distortion. This western trade is of increasing importance, and consequently the Samos-Kydonia route, which has the further recommendation of being in the same line with the Sardis-Ephesos section of the great road, becomes axial for the cartography of the southern Ægean, and the Kydonia-Sicily axis for the middle basin of the Mediterranean. Greece and the Kyrenaica, South Italy and Tunisian Africa, are plotted as pairs of symmetrically opposed promontories on each side of it; and Crete and Sicily as axial, or nearly axial, islands.

We have seen that the actual axis of the central and western Mediterranean very nearly cuts Delphi; but we owe the appreciation of this fact to an independent and early Corinthian symmetry on the axis of the Corinthian gulf, and to the fact that Eretrian trade kept mainly northward, close to Peloponnese, and avoided Kyrene. It is thus that we must account, first for the early local antithesis between Europe and Peloponnese, and then for the tendency in Delphic, Eretrian, and Corinthian circles, to regard Peloponnese, and not Crete, as the medial land mass. Thus, in the rhetoric of Aristagoras, Sparta, as champion of the West, stands pictorially, as well as politically, opposed to Susa in the East, with the great road from Miletos lying as a direct avenue between them.

The westernmost basin of the Mediterranean, beyond Sicily, was explored, so far as Greeks were concerned, wholly by the Phocæans, whose great depôt was at Massalia. They were in close commercial union with Samos, and therefore used the Samian charts, in which the axis runs north of the true west from Kythera to Sicily, and in which the trade routes converged upon Messana. Now, the Italian coast route was closed to philo-Samian traders by the commercial alliance between Miletus, Sybaris, and the Tyrrhenians. Consequently, Phocæans bound for Massalia steered first for the Samian colony of Lipari, and then between Sardinia and Corsica, as the homeward-bound for Marseilles still do. Therefore Sardinia and Corsica were placed symmetrically about the newly-prolonged axis. This ended for the moment at Massilia, and consequently all subsequent routes west of Massilia were appended either as prolongations of this or as bifurcations from the Bonifacio channel. The identification or re-identification of the Pillars of Herakles at Gibraltar, which must needs be on the axis of the Mediterranean; the discovery of the Balearic chain, in a position which is actually nearly axial; the growing importance of the direct trade with Tartessos; and the exploration by Phœnicians, Tyrrhenians, and Greeks of the coast of Mauretania and Numidia, combined to substitute, as axis, the actually very crooked line Messina—Bonifacio—Minorca—Gibraltar, for the actually straight line Messina—Bonifacio—Massilia. We have already commented on the difficulty of estimating, without instruments, the amount of a change of course where the change is not almost instantaneous; and it is worth noticing that any empirical distortion which might be noticed was probably fully compensated for by the great gain in symmetry between the north and south shores of the basin. For, in proportion as Sardinia and Corsica are shifted more nearly into line between the Pillars of Herakles and Sicily, the more the great bay between Spain and Italy must be flattened out, and the more the north coast of Africa must be pressed in, if they are to maintain their observed radial distances from the central pair of islands.

It will be noticed at once that on this hypothesis the breadth of North and Central Italy is enormously exaggerated, and the two coasts are set at a right angle with each other. Here is a crucial point in which this theoretical reconstruction of the map may be tested, and tested, as it happens, from a passage of Herodotus himself. The west coast of Greece and Illyria was traversed and surveyed by

trading vessels up a well-defined route from Corcyra to the head of the Adriatic. Now, there are points enough in the Adriatic from which both coasts can be seen simultaneously, so as to make its extreme limits of width a matter of certainty; consequently, the east coast of Italy must have been mapped parallel with the west coast of Illyria. And there can be very little doubt that the tendency was to regard the axis of the Adriatic as meridional rather than as equatorial.

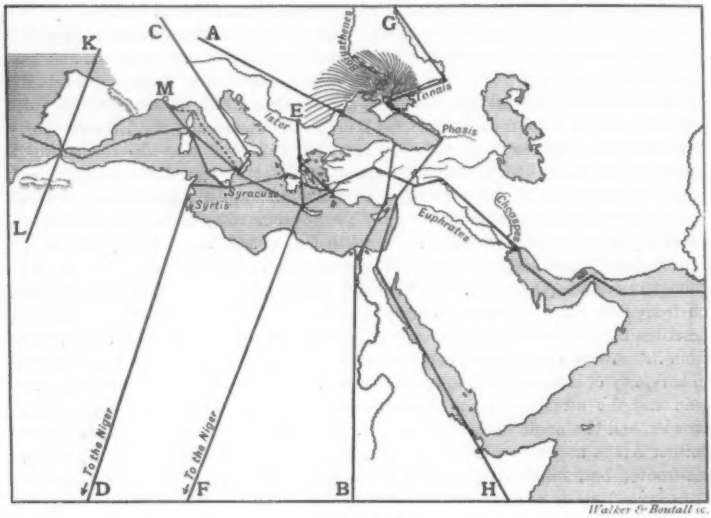
But, on the other hand, we have seen that the Western Mediterranean was first regularly traversed and surveyed on the line from Messana to Massilia, and that this tended to be regarded as equatorial. Now, the west coast of Italy does actually lie approximately parallel with this line, and we know that it was itself provided with an inshore route from Sybaris *viâ* Laus to Populonia and the Etruscan ports. Therefore the west coast of Italy, as surveyed from the sea, also tended to be plotted as equatorially situated, and consequently at a right angle with the east coast. Of this view of Italy we have a totally undesigned confirmation in Herodotus (Δ. 99), where, after comparing the Tauric promontory of Scythia with Attica, he says, for the benefit, obviously, of a South Italian audience, "If any one has not sailed along these coasts of Attica, I will explain to him another way. It is as though in Iapygia (the heel of Italy) another race, and not Iapygians, were separated off from Brentesion to Taras (Taranto), and inhabited the promontory." Now he describes Scythia as a square with two sea-coast sides, and the Tauric ἀκτή projecting from its seaward angle; and there is reason to believe (from the general admiration in antiquity of the race back to Athens after Marathon between the defenders overland and the attacking force round Sunion) that Attica was regarded as being broader, and the angle of Sunion obtuser, than it really is. Now on the real map neither Attica nor Italy enclose anything like a right angle between their principal sea-fronts; but, unless Herodotus believed that they did, why did he select them, as he says, "out of a large number of suggested instances," to compare with his rectangular Scythia?

How little Herodotus himself knew of the top of the Adriatic is shown by his scepticism about the existence of a river Eridanos (Γ. 115), which some one had described to him as flowing northward through Europe—probably a confusion of Eridanos-Rhodanos-Rhe[de]nos. If he knew much of the Po, he could hardly have written as he did; if, however, he knew of its bare existence, it would only strengthen the parallel with Scythia, by indicating the north side of the Italian square.

Look now for a moment at the result we have gained: a Mediterranean on the Greek map, narrowed in proportion to its length, but admirably symmetrical. The Pillars of Herakles, with the Pyrenees and Atlas in the background; the central Balearic chain, the twin islands Sardinia and Corsica; the central island Sicily between Italy and Tunis, Tyrrhenians and Carthaginians; then the Syrtis and the mouth of the Adriatic—the tumultuous ravening Scylla, perhaps, and the bottomless, insatiable Charybdis, of the early voyagers; then Greece and Kyrene. Here we see why Herodotus makes so much of the fall of Kyrene, if it *corresponds*, in his historical geography, to Sparta and Athens, and why he would note with such care that the southward road from Kyrene past the Nasamones (Β. 32), and the northward road from Chalkidike through Macedon—both largely used by Samians—strike respectively the upper course of the Nile and of the Ister. Then come Crete (in the Samian scheme) and Peloponnese (in the Milesian), approximately central islands between two great bays. Then Asia Minor, dividing the eastern arms of the Mediterranean, and washed on the one side by the "Cyprian Sea" of Aristagoras, on the other by the Euxine, and crossed by the great meridian, from the Cilician Gates *viâ* Pteria and the Halys frontier to Sinope; then, in the angles, the correspondent rivers Phasis and Pyramos.

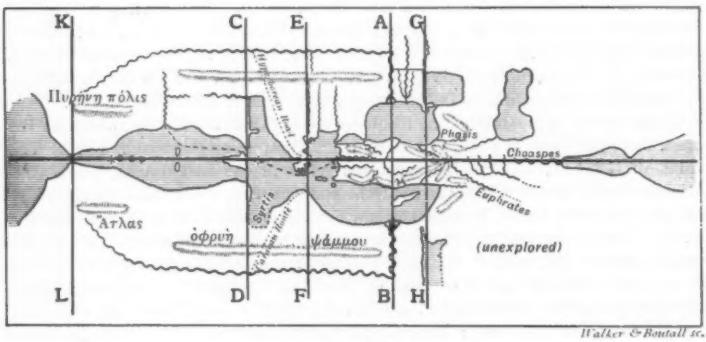
Note that the Sinope-Pteria-Cilician line is again, as Prof. Ramsay has shown, a very early and very important *cross-road*.

The exploration of the Euxine, and the opening of Egypt under the XXVIth Dynasty, both within the same fifty years, and both largely due to Milesian enter-



Walker & Boutall sc.

REAL MAP.



Walker & Boutall sc.

THE IONIAN MAP.

prise, led to additions to the Milesian map, which are, even actually, fairly symmetrical; and the quadrilateral scheme of indigenous Egyptian geography may very well have suggested, as its northern counterpart, the quadrilateral symmetry of the "Scythian square."

The great passage about the Nile and the Ister (B. 33) shows how the courses of the two rivers have been made to supplement each other. For because the Nile

flows, for all its known course, along the great meridian from south to north, so the Ister must flow in its lower course along it also from north to south; which means, that when local surveys of Western Scythia, with the lower Ister as base-line, came to be incorporated with Central Scythia, surveyed up the Borysthenes, with Eastern Scythia surveyed along the Mæotis coast route, and with its Egyptian counterpart in the general mercantile chart at home, the local orientation of the lower Ister, *πρὸς εὖρον ἄνεμον τὸ στόμα τετραμμένος*, preserved for us by Herodotus (Δ 99) in describing the large-scale local chart, was ignored; and so the Ister was erected into the western boundary of a Scythia, the central and eastern parts of which had been independently surveyed from the base-lines of the Euxine coast, the Mæotis coast, and the course of the Borysthenes. Conversely, because the trade road up the Ister is known to have a general westerly trend, and because its upper course, as calculated from itineraries, ought to extend into the Keltic country, namely, behind the Alps and the Pyrenees (the *Πυρήνη πόλις*, Herodotus, B. 33), therefore the Nile must continue the westward trend it acquires where it is last known, and must rise *ἐκ τῶν ἴσων μέτρων τῆς Λιβύης*, that is to say, behind Atlas, which for these purposes is symmetrical with the Pyrenees. Observe here that the Milesian editor knows nothing of the wholly inconsistent river and road system of Southern Gaul, which must by this time have been established by the Phocæan traders of Massalia, Phocæa being philo-Samian, and Miletos having consequently no dealings in Gaul.

The diagrammatically westward course assigned to both rivers is probably partly due to the desire which the whole of the Libyan section shows to construct the map for these parts on a series of latitudinal belts. And a similar parallel of latitude was obviously of the greatest value in determining the probable depth of the Hinterland at the top of the Adriatic and the Gulf of Genoa, where the error in the long traverses must have been getting serious. Of course the conjectural westward course of the Nile was held to be *demonstrated*, when the news came up from Kyrene that a westward-flowing river (probably the Niger) had been found beyond the Libyan desert, and far west of the meridian of Kyrene (B. 32).

With the better investigation of the Isthmus of Suez and the Sea of Azof, a conflict between the theoretical and the empirical geographers appears to have arisen, which has left a curious trace in the narrative of Herodotus. In theoretical geography there ought to be a water-channel between the Arabian gulf and the Mediterranean, for the Arabian gulf corresponds, in Ionian symmetry, with the Palus Mæotis, and the Palus Mæotis opens freely into the Euxine by the Kimmerian Bosphoros. See, then, what Herodotus says about the future of Egypt (B. 11). After describing how the Nile has silted up its own former estuary, and how the Arabian gulf runs parallel with the Nile valley, he continues, *Εἰ ὦν ἐθελήσσε ἐκτρέψαι τὸ ῥέεθρον ὁ Νεῖλος ἐς τοῦτον τὸν Ἀραβικὸν κόλπον, τί μιν κωλύει ῥέοντος τούτου ἐκχωσθῆναι*; the Nile, that is, may be expected some day to swing round and fill up the Arabian gulf; and if everybody had their rights, and an impish *τύχη* did not interfere in the dispositions of Nature, the Arabian gulf would be continuous with the Nile valley, and would be only waiting, to be silted up, till the bar at the existing mouths had become sufficiently extended to impede the northward outflow.

Hence the interest with which contemporaries regarded, and Herodotus records, the attempts to rectify the omission by cutting a canal from the Nile to the Arabian gulf. It involves more than the mere admission of Milesian traders into the theoretical counterpart of the Palus Mæotis, which is theirs already; it is a definite rectification by human agencies of a flaw in the natural universe. Such power has the *à priori* conception, when supported, as this theory was, by a number of confirmatory and subsequent discoveries. Exactly the same ideas are involved in another passage (Δ. 39), which we shall learn to regard as belonging

to the Persian map, where after describing the narrow tie which binds Libya to the Arabian ἀκτή, Herodotus says of Arabia, Λήγει δὲ αὕτη, οὐ λήγουσα εἰ μὴ νόμῳ ἐς τὸν κόλπον τὸν Ἀραβικὸν, ἐς τὸν Δαρεῖος ἐκ τοῦ Νείλου διώρυχα εἰσήγαγεν, which we may paraphrase. "The promontory ends, or rather it does not end except in theoretical geography, at the Arabian gulf. This is the point where the Great King has done his best to make it end actually, by cutting a continuous water-way,"—an association of irrelevant ideas, which, except on this hypothesis, is not easily explicable.

Passing further east, we have already seen how the eastward slew given to the Royal Road from the Euphrates to Susa makes the Persian gulf face eastward, and leaves the Milesian map-maker free to accept the statement of his explorers that the Caspian is a closed sea of no great extent, and consequently to r. 115 to mark the presumed sea-passage round the north of Europe as *totally* unexplored; whereas in Δ. 40, on the Persian map, the Caspian is equated to the Red Sea or Southern Ocean, and consequently must be supposed to have been represented as opening into the Northern Ocean, as it is in Eratosthenes' map, which is likewise largely indebted to Oriental sources.

The Persian Map.

The account thus given of what it is convenient to describe as the Ionian Map includes nearly all the passages of Herodotus which bear upon the geography of the Mediterranean basin; but there is an important group in the early part of Book Δ. which are utterly inconsistent with the scheme thus laid down. No amount of distortion will reconcile the axial points indicated with the axis of the Ionian map, whereas they conform to one another in a nearly direct axial line. Further, though the passages have a peculiarly formal and authoritative tone, there is no mention of the Nile-and-Ister meridian, which is replaced by another meridian much further east; and, though Herodotus claims to be describing the appearance of all three continents, he says far less about Europe than he elsewhere shows that he knew. As he begins with the significant words οἵη τίς ἐστιν ἐς γραφὴν ἑκάστη, it is clear that he is describing somebody's map; and, in the conclusion of the section, he mentions Skylax of Karyanda as the authority for one of the most important statements in the whole passage. The whole passage may be rendered as follows:—

"The truth in this matter I will now proceed to explain in a very few words, making it clear what the real size of each continent is, and what shape should be given them.

"The Persians inhabit a country upon the southern or Erythræan Sea; above them, to the north, are the Medes; beyond the Medes, the Saspirians; beyond them the Colchians, reaching to the northern sea, into which the Phasis empties itself. These four nations fill the whole space from one sea to the other.

"West of these nations there project into the sea two tracts (or promontories, Gk. ἀκταί), which I will now describe. One, beginning at the river Phasis on the north, stretches along the Euxine and the Hellespont to Sigeion in the Troas; while on the south it reaches from the Myrrandian gulf, which adjoins Phœnicia, to the Triopic promontory. This is one of the tracts, and is inhabited by thirty different nations.

"The other starts from the country of the Persians, and stretches along the Erythræan Sea, containing first Persia, then Assyria, and after Assyria, Arabia. It ends, that is to say it conventionally ends, though there is no breach of continuity, at the Arabian gulf—the gulf whereinto Darius conducted the canal which he made from the Nile. Between Persia and Phœnicia [*i.e.* between the ἀκταί] there lies a broad and ample tract of country, after which the region I am describing skirts our sea [the Mediterranean], stretching from Phœnicia along the coast of

Palestine and Syria till it comes to Egypt, where it terminates. This entire tract contains but three nations. The whole of Asia west of the country of the Persians is comprised in these two regions.

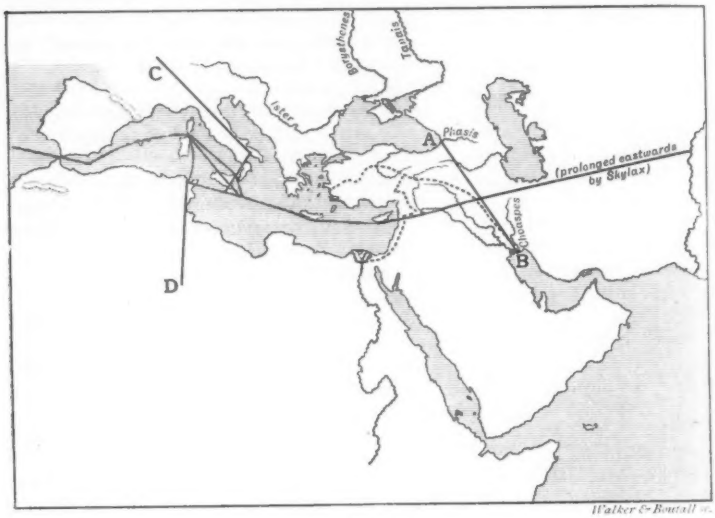
"Beyond the tract occupied by the Persians, Medes, Saspirians, and Colchians, towards the east and the region of the sunrise, Asia is bounded on the south by the Erythræan Sea, and on the north by the Caspian and the river Araxes, which flows towards the rising sun. Till you reach India the country is peopled; but further east it is void of inhabitants, and no one can say what sort of region it is. Such, then, is the shape, and such the size of Asia.

"Libya belongs to one of the before-mentioned tracts (ἄκραι), for it adjoins Egypt; in Egypt the tract is at first a narrow neck, . . . but from the point where the neck ends, the tract which bears the name of Libya is of very great breadth."

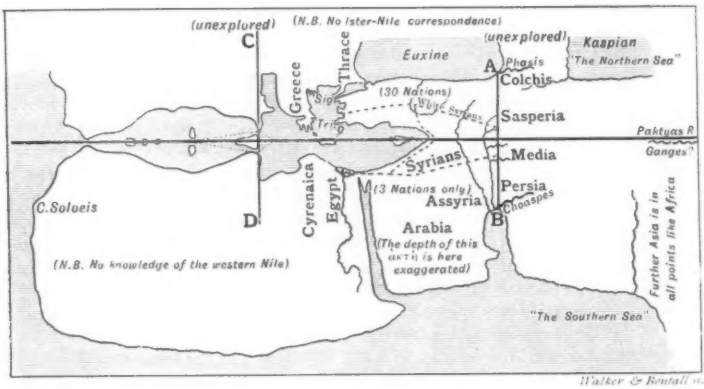
Here we have a map which is essentially a map of the Persian Empire and its immediate neighbourhood. Its principal meridian joins the mouth of the Choaspes and the mouth of the Phasis, which apparently are symmetrical and both flow east. This meridian, though designated from south to north by means of four nationalities, Persians, Medes, Saspiri, and Colchians, either actually *is*, or at least is parallel to, the line of the Royal Road from Susa to the Armenian frontier, produced, however, northwards through Armenia and the Colchian country, as soon as the road begins to trend appreciably westwards towards Kappadokia. In the same way, the two ἄκραι are constructed about two great roads, which are taken as their axes: in Asia Minor, the Royal Road from the Euphrates to Sardis; in Arabia, the caravan-route from Carchemish through Palestine to Egypt.

The southward slew of the Royal Road throws Arabia westward, and the error of the South Sea explorer (Δ. 44) in crossing the mouth of the Persian gulf, under the impression that he was close to the known estuary of the Choaspes and Euphrates, obliterates the eastward sea-coast of Arabia, and makes it look on the map like an ἀκτή bounded by sea-coasts on north, west, and south. Observe that Eratosthenes, who greatly exaggerates the breadth of the Persian gulf, makes it symmetrical with the Caspian, as narrow-mouthed gulfs of the northern and southern sea respectively. The slewing round of Arabia, in its turn, affects the coast of Syria and Palestine, which comes to look north-west, so that the (dark-complexioned) Syrians in the southern correspond to the (Kappadokian or white) Syrians in the northern peninsula (A. 72, E. 49, H. 72); the Egyptians, who have quite lost touch of their Scythian antipodes, correspond, though forcedly, and less exactly, with the Kolchians (B. 105), north and south of this Syrian area; and the Mariandynic Gulf (Gulf of Alexandretta) is made much more nearly an eastward termination of the Levant than it really is. Cyprus is a central island, like Crete and Sicily. Now an axis, on which Cyprus lies, and about which Asia Minor and Arabia lie as symmetrical ἄκραι, cannot but be the local axis or equator of one of the northern towns of Phœnicia, whose earliest sea-trade was first to Cyprus, and thence obliquely down to the Delta. Such an axis it is easy to conceive gradually produced, like our Ionian axis, westward through Crete and Sicily, as Phœnician trade went westward, and made the basis of a sailing chart of the Mediterranean which corresponds more and more closely with the Ionian as it gets further west, and becomes identical with it just in the area where Greek and Phœnician trade most clashed; namely, in Carthaginian, Sicilian, and Tyrrhenian waters. We may safely affirm that we have here, as one source, at any rate, of this Oriental scheme, the general Phœnician chart of the sea, which in this aspect is literally "Mediterranean," *i.e.* between the two ἄκραι. The Euxine is here made symmetrical with the Southern or Red Sea, which argues very imperfect acquaintance with the Caucasian and Scythian regions. The passage about the Kaspian (Δ. 40) is equally vague, and has been already shown to be inconsistent with the passage

(A. 203) of the Ionian scheme. All that is clear is that the south shore of the Euxine, the river Phasis flowing west, the river Araxes running east, and the south shore of the Caspian, are conceived as lying approximately in the same straight line. But nothing is known of the northward extension of the Caspian, or of the Hinterland



REAL MAP.



THE PERSIAN MAP.

of the Caucasus, except, in a vague way, that Europe extends along the whole north of Asia, from which it is separated by the Caspian just as the same northern continent extends over the whole north of Libya, and is separated from it by the Mediterranean. Here we have the explanation of Herodotus' insistence that the

north-eastern sea, that is to say the Caspian, ought to be accessible from the south-eastern ocean; for if the Caspian is truly co-ordinate with the Mediterranean, it must have its own Pillars of Herakles somewhere in the far east. East of the Phœnician coast, the axis was in all probability co-ordinated with an equally old, but quite independent, equator of Nineveh, which is on the same real parallel of latitude as Myriandos, and was the natural basis of earlier Assyrian surveys.

Further east, again, the equator of Ecbatana is on the same real parallel as Tyre, and nearly halfway between the Caspian and the head of the Persian gulf. This equator, in its turn, was the natural basis of the Median surveys on which Darius founded the assessment of his new satrapies, with which we may well compare the improved maps which were made for Augustus in compiling his statistical account of the Roman Empire. Of one of the expeditions connected with these surveys, Herodotus gives an account (Δ. 44) which is of importance as indicating the authority from whom he got this map. Skylax of Karyanda was ordered to strike eastward, and prolong the meridian to the eastern sea; then to turn southward and westward, and return by way of the Arabian gulf. Herodotus confuses this eastward expedition, which may or may not have reached and descended the eastward flowing Ganges, with an exploration, very likely undertaken by the same Skylax, of the lower course of the Indus. Now, the upper Indus must have been already known perfectly well to the border states of Persia; it flows too definitely south to have been mistaken, even by the most theoretical geographer, for an eastward stream. Moreover, Ἰνδὸς ποταμὸς does not necessarily mean more, even to Herodotus and Skylax, than "*an* Indian river," though, in fact, the name was probably already acquiring its special significance. In any case, we are dealing here with a purely empirical discovery, whatever structural use was made of it afterwards. This discovery is the determination of an eastward-flowing river, which reached a sea whence there was a return to the Arabian gulf southwards and westwards, which proved Asia to be *in all points* like Libya. This last point is important, because it tacitly proves that a southward extension of Asia, well within the tropic, was observed, like that reported of Libya,* and affords a hint in favour of, rather than against, the obvious conjecture that the eastward-flowing river with crocodiles is the Ganges, and that an expedition, whether that of Skylax or only reported in his 'Indica,' doubled Cape Comorin; a voyage for which thirty months is not too long, though it *is* too long for the journey home from the mouth of the Indus. The period of thirty months is, moreover, one of the strong points of resemblance between the two voyages. For thirty months make two and a half years, and the circumnavigation of Libya is stated (Δ. 42) to have occupied between "two and three years" (twenty-four to thirty-six months).

The Ganges, when found, was of course of great theoretical value, as a natural feature which could be taken as coinciding with the Persian axis; and it replaces the eastward Choaspes of the map of Aristagoras, in the map of Eratosthenes, by whom it is placed rather south of the equator of Rhodes, but north of that of Alexandria.

The cosmographic Persian Map, thus outlined, is evidently of composite origin. It includes the Mediterranean geography of the Phœnician charts, the older surveys of Mesopotamia and Media, and the recent discoveries of the expeditions of Darius. The amount of symmetry imported into it may of course be indigenous to Persian geography, of which we know very little, but it certainly looks as if the

* Δ. 42. The Phœnician explorers sent by Necho circumnavigated Africa from the Red Sea to the Pillars of Herakles. As they went round thus *westward*, "they had the sun on their right"—*i.e. north* of them at midday—when they made their observations.

fusion of the surveys had been effected by some one trained in the methods of the Ionian school; and with the name of Skylax in the narrative before us, we can hardly doubt that it was he. The distortion of the well-known coast of Syria, Palestine, and Egypt also looks like the work of a compiler to whom the southern ocean was more familiar than the Levant. A further piece of incidental evidence in favour of the same view will be adduced later on.

So much for the two universal maps which Herodotus appears to have used. All the geographical passages in his work seem to fit in with one or the other of the outlines thus indicated:—the majority with the Ionian map; the descriptions of Oriental countries, without exception, with the Persian.

An Explanation of the Ionian Inaccuracy northwards, and of the Persian Inaccuracy southwards.

It remains to give some account of the divergence of these outlines, especially of the north and east of the Ionian map, from the real geography, and in the course of this to consider a few subsidiary questions which will answer themselves in the course of the discussion; in particular, the problem of the proper division of the world into continents.

It will be seen at once, by a comparison of the Ionian with the real map, that though, so long as they remain in Asia Minor and the Mediterranean, the meridian and the equator maintain their proper directions with tolerable regularity, the case is quite different with their northward and eastward extensions. And it is also noteworthy that the distorted part of the meridian, namely, from Sinope to the mouth of the Isser, if produced upon the real map, very nearly coincides with the trend of the section of the royal road from Euphrates to Susa, which forms the distorted eastern arm of the equator. It will be also seen that the angle enclosed by the southern half-meridian, Nile—Cilician Gates—Pteria, and the western half of the equator from Pteria to Sardis and beyond, is in the real map less than a right angle. The general result of this comparison between the Ionian and the real map may be expressed as follows: That, of the quadrants of the Ionian map, the north-eastern is practically a semicircle, while all the other three quadrants are correspondingly reduced.

Now, it is precisely of this north-east quadrant that Herodotus, and fifth-century geographers in general, have nothing to say. His account of the Kimmerian invasion of Asia (Δ. 12) indicates the prevailing ignorance of the physical features of the Caucasian side of the Euxine; and his account of the Caspian Sea and the "endless plain" east of it contributes very little more. He knows that the Caspian cannot be entered from any known sea (A. 203), and he gives its proportions fairly well; and we have seen reason to suspect that the sea-passage round the north of Europe, which he argues *must* exist, because Asia and Libya are circumnavigable (Γ. 115), is associated in his mind with the existence of this sea on the north of the Persian "Hinterland," for he equates it (Δ. 40), in his "Persian" symmetry, with the Red Sea to the south of the same "Hinterland."

But, beyond the merest outlines, Herodotus, and the Greek world generally, knew practically nothing of the north-eastern semicircle of the real map; and having, as a map-maker would say, no "tie" between the long eastward traverses north and south of their equator, they naturally tended to underestimate its extent in proportion to the south-eastern semicircle. This is in itself enough to account for a very considerable distortion of the Ionian map; but there is a further consideration which tended in the same direction, and which was particularly cogent at the time when Herodotus wrote.

In Δ. 36, 42, 45, and B. 23, Herodotus criticizes severely his geographical predecessors (with patent reference to Hekataios) for dividing the known universe into three equal continents, and in particular (Δ. 42) for making Europe equal in extent to Asia. Canon Rawlinson (on Δ. 45), Sir E. Bunbury (vol. i. 146), and others, say that two different theories are here in question: an earlier division into two continents only, Europe and Asia; and a later into three, Europe, Asia, and Libya. But as Libya is well known to Greece as far back as Homer's time, at all events, it is not clear to what period the earlier classification is to be assigned; and, besides, the principal authorities for the twofold division (Hippias of Elis, pp. 2, 4; Isokrates, 'Paneg.,' p. 179 (Baiter); and in Roman times, Agathem., II. 2; Sall., B. 7, 17, 2; and Varro, L.L. v. 31) are all later than Herodotus; earlier is only Æsch., 'Prom. Sol.' 2—

τὴν μεν δίδυμον χθονὸς Εὐρώπης
μέγαν ἠδ' Ἀσίας τέρμονα Φᾶσιν,

which proves nothing for or against a Libyan continent, as only the Europe-Asia frontier is under discussion.

It is not a twofold division which Herodotus is criticizing, but an equalization under the form of thirds, of two divisions, which for him are a half and a quarter respectively. Sir E. Bunbury was, further, certainly not in accord with Herodotus when he said that Hekataios recognized the established division into three continents, regarding Asia and Africa together as equal in size to Europe; this is exactly what Herodotus himself proposes as an amendment to the Ionian, and apparently Hekataian theory. The latter point is closely connected with another controversy, on which also he has a positive opinion of his own, directly opposed to that of Hekataios. The latter had divided Europe and Asia at the Tanais; Herodotus, like Æschylos (P.S. 2, above), divides them at the Phasis, *i.e.* east and west, *i.e.* north and south, making Europe, as he expressly says (Δ. 42), as long as Asia and Libya put together, along their joint frontier east and west; that is, he gives Europe the whole northern semicircle. Hekataios had given Asia the whole eastern semicircle. The view of Hekataios prevailed, though not absolutely, in later geography, and our maps still make Europe end at the Ural, and gives Siberia to Asia. There are those who believe that Russia supports the view of Herodotus!

The whole controversy about the limits of the three continents arises from the fact that, in the fifth century, empirical geography was beginning to upset the traditionally accepted meaning of the terms in question. The names Europe, Asia, and Libya are, in the first instance, nothing but a geographical classification of the shores of the Mediterranean Sea, probably at a time when it was practically unknown beyond Sicily and Cape Bon, and when it was taken to be literally "Mediterranean," the nave of a wheel-shaped universe of which the Okeanos or "Extraterranean" sea is the rim. Mediterranean and Extraterranean were in primitive geography united by three radial straits, each with an inward flowing current like that of a river—(1) that between Scylla and Charybdis, namely, the Strait of Messina; (2) that between the Blue Wandering Islands, namely, the occasional pack-ice in the Bosphorus; (3) the Nile, which Hekataios believed to rise somehow in the Ocean; probably based on a Soudanese tale of a visit to the Great Lakes. Odysseus, it will be remembered, has his choice between the Messina and the Bosphorus route, on his return from the ocean-washed Kimmerian country, namely, the Hinterland of Europe.

When the Euxine was explored, and the Nile was found by more up-to-date thinkers than Hekataios to be only a river, with its source in West or Central Libya, the map was rectified by subdividing the land area between the Mediterranean and Okeanos by three radial frontiers between the Hinterlands of these three divisions

of the coast. As the coast lands are *à priori*, and empirically also, nearly equal, the doctrine of three naturally equal continents arises as a natural corollary. The division between Europe and Libya is obvious; it lies along the axis of the Mediterranean, and issues into the circumambient ocean between the Pillars of Herakles. We have seen how this axial line was adopted as the production westwards of each of the great geographical equators. The frontier between Libya and

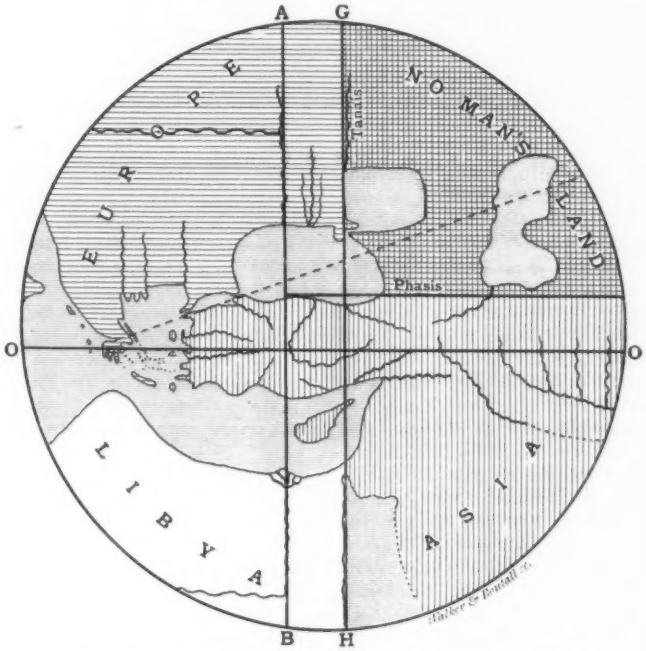
REAL MAP, SHOWING THE EMPIRICAL BASIS OF THE THEORY OF THREE EQUAL CONTINENTS.

(1) *Small circle:* Primitive Ægean geography with Delos (probably) as centre; the angles subtended by the continents are *actually* 120° each.
(2) *Large circle:* the same with Delphi as centre, somewhat more advanced.
(3) The dotted lines show the *first* stage of the "Phasis-Tanais controversy."

Asia is equally clear. It is at first the axis of the Nile valley; and later, when that is rejected as bisecting a nationality, it is parallel to the Nile valley, and lies in the axis of the Arabian gulf. This latter is also the more obvious to a geographer approaching from the east, and is accordingly adopted in the Oriental map, which, as we have seen reason to conjecture, may have been edited by Skylax of Karyanda. Let us note, in passing, that in the Ionian symmetry, the western shore of the Arabian gulf is co-ordinated with the western shore of the Mæotis Palus (Sea of Azov). This is why Hekataios, looking for a landward production of the same meridian, makes the Tanais the natural frontier between Europe and Asia.

To return to the continents, however; Libya being thus delimited by the Mediterranean Sea and the Arabian gulf, the remaining land-mass of Europe and

Asia is at first simply bisected by the line of the Hellespont and Bosphorus, which does actually, if produced, cut the axis of the Western Mediterranean in Central Greece, not far from Delphi, the theoretical point of intersection. But the exploitation of the Euxine by Milesian navigators removed the problem one step further afield. The Hellespontine frontier, if produced on the real map, cuts the Caucasian coast about midway between the Kimmerian Bosphorus and the Phasis,



IONIAN MAP, SHOWING THE SECOND STAGE OF THE "PHASIS-TANAIS CONTROVERSY."

Three *quadrant* continents, and the fourth quadrant assigned by Hecataios to Asia ||||; by Herodotus to Europe ≡.

and in a region where no natural frontier exists. Consequently, pending further exploration (for this piece of coast remained unattractive, unknown, and probably underestimated in extent), the line between Europe and Asia was left arbitrarily drawn, and two schools of geographers arose, one arguing, in favour of the Phasis, that either the frontier must be twisted southward or the topography northward; the other, that either the frontier must go north, or the topography south, in favour of (1) the Kimmerian strait, (2) the western shore of the Mæotis, and (3) the course of the Tanais, when that was discovered beyond. This meridian of the Tanais was known to Ptolemy and adopted by him. We have already seen how the fact that the Arabian gulf frontier lay nearly in a line with the Tanais was adduced in favour of the latter view, when once the idea of continental equality was shaken.

Herodotus, as we have seen already, treats this view as ridiculously old-

fashioned, and it is easy to show how and when this change of attitude took place. One of the first and most important pieces of empirical geography on the grand scale was the circumnavigation of Libya, about the year 600, for Pharaoh Necho of Egypt; which we may probably take to be historical. This, at all events, if not earlier researches, perhaps even native Egyptian doctrine, seemed to indicate (though, as we know, wrongly) that the axis of the Arabian gulf is more nearly at right angles to that of the Mediterranean than at the 120° which the tri-continental scheme demands, and which corresponds much more nearly with the facts. The equation of the Red Sea coast with the Mæotis-Tanais meridian of the Nile with the Ister, and of the Egyptian with the Scythian square, confirmed the distortion thus suggested. At all events, the Nile valley was always taken to be at right angles to the Mediterranean axis; and the Arabian gulf was taken as parallel to the Nile valley, as Herod. B. 11 seems to indicate, and as is otherwise probable.

Here, then, was a problem. Libya is, *à priori*, equal to either Europe or Asia, for all three are "Hinterlands" of equal coast-lines. Compare the tacit reasoning that Euxine and Mæotis are equal in area, because they stand on equal coast-sides of the Scythian square. But Libya has been shown to be contained within 90° or one quadrant, instead of 120° or one-third of the circle. Therefore both Europe and Asia, properly so called, ought also to be contained each within one quadrant; and recent researches, mainly Milesian, had shown that the Phasis, running east and west, bounds the quadrant of known Asia, and the Tanais, running north and south, bounds that of known Europe. But though the equality of the continents is thus reconciled for the moment with the quadrant form of Libya, there is a fourth quadrant on the real map, which is still unaccounted for, namely, the No-Man's-Land between Tanais and Phasis; and it is the question whether this quadrant ought to be counted as European or as Asiatic, which exercises the contemporaries of Herodotus. A new school has arisen, which throws overboard the theory of equal continents, and gives the odd quadrant either (with Hekataios) to Asia, which thus becomes an eastern semicircle, with a quadrant Europe and a quadrant Libya west of it; or (with Herodotus) to Europe, which becomes a northern semicircle, with Asia and Libya as east and west quadrants of it. Herodotus, moreover, as we have seen, makes a further step towards emancipation by his critical examination of the names Europe, Asia, and Africa, and by his positive declaration (in the case of Egypt and the old Nile-frontier, which was retained by Hekataios) that, continents or no continents, geographical divisions must not be allowed to bisect a nationality.

All these considerations, however, only affected universal geography, and the fitting together of the departmental maps. These latter, as we have seen, were probably throughout constructed by plotting out empirical topography on roughly rectangular construction-spaces, of which the base or axis was usually a line of road. These lines might of course lie in any direction, but preference was apparently given to those which were approximately oriented. Consequently, when these local maps come to be co-ordinated by Ionian theorists, who did not always know the ground, their several principal meridians tended to be forced into parallelism, irrespective of their true orientation. In particular, the lines of the Ister and Tanais were brought through a considerable real angle from north-east towards north-west, to square with the meridian and equator of the Ionian maps of Asia Minor, to which they were now appended. That Herodotus had indications of the true bearing on the separate map of Scythia is, however, probable from his statement (Δ. 99), that his mouth of the Ister points *πρὸς εὖρον ἄνεμον*—that is, east-south-east. This is the compass mark, as we should say, which gives the true local and empirical orientation of the lower course of the Ister, and so of the Scythian square. In the general

map, the indication either was wholly disregarded, or was interpreted, as the expression of Herodotus suggests, as applying merely to the estuary of the river (B. 34).

Similarly, all local work, both Greek and Persian, in Asia, was probably surveyed left and right from the Royal Road. As the Royal Road in the section from Sardis to Euphrates is, over all, fairly direct, and even more so in the section from the Euphrates to Susa, these two sections of it naturally became the continuous baselines for more general maps. All Greek work, in particular, was plotted in, as we have seen, as though the Royal Road continued east of the Euphrates in the same line as its western half. Consequently, the topography of the Persian empire is, on the Ionian maps, slewed round from south-east to north-east.

If the country behind the Caucasus had been as well known to Greeks as the roads in Scythia, or even in Mesopotamia, the compression of the intervening areas, between the northward slew of Mesopotamia and the eastward slew of Scythia, must have been obvious and intolerable, and must have led to a re-examination in particular of the course of the royal road. But this is the same No Man's quadrant which has already puzzled the universal geographers. They have a double inducement, therefore, to diminish both the length of the coast-line between the Tanais and the Phasis and the angle enclosed by these streams, so as (*a*) to efface the awkward Caucasian blank between their two nearest departmental maps, that of the Tanais-Ural route, and that of the Phasis-Caspian route, and (*b*) at the same time "to make Europe equal to Asia," as Herodotus says, by literally splitting the difference; a process which he rightly rejects as antiquated and absurd (Δ. 36).

So much for the Greek view of the trend of the Royal Road, and for the influence of this upon the Ionian universal map. We have now to point out that the great meridian of what we have called the Persian Map is plotted out in the same way along the Euphrates-Susa half of the Royal Road, but that here the road is slewed round in the opposite direction, from north-east—south-east to north—south, so as to correspond with the "column of nations" which we detected to begin with. The result is that in the Persian map the line of the Euphrates-Susa road is meridianal, whereas in the Ionian map it is equatorial. The Persian map, however, is so far superior to the Greek map, that it keeps Asia Minor as a projection westwards from that "column," and consequently exhibits the great bend in the road, but sums it up as a single right angle at the Euphrates ford, and exaggerates it in consequence of the southward slew just mentioned. This retention of Asia Minor as an eastward ἀκτή is itself an important point; for it indicates that the editor of the map used an Ionian symmetrical map to fill in this section of his compilation, and increases the probability that this editor may have been Skylax of Karyanda.

The southward slew of the royal road has a further consequence, which is important as regards Herodotus himself and his sources. The parts of Asia north-east and east of the road are exaggerated by this slew, in proportion as Arabia and the parts west of it are thrust from south-west to west. Consequently, the No Man's land north of the Phasis becomes of less importance, so to speak, to Asia, and the Phasis frontier gains in acceptability as against the Tanais. We may, therefore, probably refer the preference of Herodotus for the Phasis frontier to his peculiar acquaintance with the Persian map, and obvious preference for it over the Ionian, in matters of further Asiatic geography. It is a further question whether we ought to see in this an additional reason for inferring communication between the historian of Halikarnassos and the geographer of Karyanda.

After the reading of the paper, the following discussion took place:—

The PRESIDENT said: I think the interest of Mr. Myres' paper arises in the first place, from its originality, for I never before remember an attempt to draw

the maps which Herodotus used from his text; and, in the second place, its suggestiveness. I have no doubt several gentlemen would like to discuss some of the points raised. I will call on Mr. Beazley, who is the best authority here.

Mr. RAYMOND BEAZLEY: I have not sufficient acquaintance with the technical construction of maps to speak about them in connection with this paper, which has been extremely interesting to me. The only remark which it occurs to me to make is about the symmetry, which is so characteristic of the maps described, and which is extremely noticeable in all maps which follow the classical period, and in the speculations of classical geographers. As Sir Edward Bunbury has pointed out, Ptolemy himself is governed by ideas of symmetrical geography—ideas, indeed, which are partially corrected by his extensive and detailed knowledge of countries; but which had more disastrous effects upon his successors. For they, following their master with less knowledge, and even more rigid symmetry, and relying far more on their imagination, planned out the world rather as they thought it should be than as even they might have thought it was. This superstition affects even some of the best Arabic geographers, who exhibit the march of Alexander to the East, and that of Hercules to the West, so as to show an equal distance from a common centre in Greece.

Mr. W. G. THORPE: So important and original a paper comes on one rather as a surprise. I must congratulate the learned author very much indeed upon the pains he has taken. I think everything is being found out now: we were told one day that a stelé, which gave writing a thousand years older than we have at present, had been found. I think that our ancestors did know a great deal more than we give them credit for. In the first place, with reference to map-making, it is impossible to doubt that there must have been a knowledge of drawing to scale, and of this I propose, in a book I am about to publish, to give my own ideas; but there can be no doubt, in the case of the Pyramids, where all the blocks had to be put together, there must have been a knowledge of drawing to scale, and of machinery, that is, the putting of power to work. Now, the point I am going to work is this: the expeditions of these earliest voyagers were made by creeping along the coast, and putting in to shore every night. They got beyond that in time, and whatever may be said of the Phœnician question in which I am a strong believer, there is no doubt that Cato held up in the senate-house at Rome a fig ripened in Carthage three days before, showing that their galleons were as quick as the present Messageries steamers, and that, at that time, they could lose sight of land and not be afraid. They *must* have had some kind of map. On this point I will mention that I have had most suggestive ideas from a gentleman named Daux, who deals at length with these points. He maintains that they had, and that there still exist, in the ruins of Carthage, some tablets which were used to communicate with ships at sea, and this seems to presume the use of the telescope. But the point I am going to put to you is this: does the author think that any maps existed before the time of Cato, which would justify a man sailing out of sight of land? I am going to put a question on one of the maps. We all know that Marseilles was colonized by Phœnicia, and it is said that they had a look-out station called Hemeroskopion, or Cape St. Martin, and I don't find any mention of this at all. The red lines are not taken to Marseilles, but seem to be taken through the Straits of Bonifacio, and not to make Hemeroskopion.

The PRESIDENT: What you ask Mr. Myres is, whether he conceives of one Ionian map, or whether of the characteristics of a group of maps. We have the map of Aristagoras, and the map apparently that Herodotus knew of. We have a Samian map, and the Hekataios map. When you speak of an Ionian map you refer to the characteristics of the group.

Mr. MYRES: I refer to the school of maps. They vary in detail, because the prime equator is slightly different in the case of different towns. There are slight deviations, but in the main body the Royal Road is the same, and the course across to Sicily is the same. Probably all used the Phocaean map to the west; I only showed Massalia as shorthand for the point touched. Of course, the point made for, and which is still made for, is beyond Toulon. Hemeroskopion is Cabo de la Nao in Spain, opposite Iviza.

Mr. THORPE: We know they had maps, or, at least, something to steer by.

Mr. MYRES: I think the maps I have been trying to reconstruct show that they had got as far as that. I think it is probable they steered by the stars. In the Odyssey, v. 277, Odysseus when trying to get back to Ithaka, is instructed to steer by the Great Bear for fourteen days.

Mr. BEAZLEY: Might I ask one question? Do I understand that Mr. Myres bases his Persian maps on Skylax, or what else?

Mr. MYRES: The map is Skylax's edition of the Persian maps, *plus* the Ionic map for Asia Minor, *plus* the Egyptian maps for Egypt and Libya, *plus* his own explorations east of the great Persian map; but not including any survey of Central Europe, Scythia, or the south shore of the Caspian.

The PRESIDENT: This has been a most interesting paper, and the interest began at the very commencement of the paper, when Mr. Myres explained to us the habit of drawing the roads in a straight line, so that the map of Aristagoras must have been like Paterson's Roads. I am old enough to remember travelling from York to London by coach. We always had Paterson's road-map, and I used to wonder how it was that they were so perfectly straight, because I found it so very different when we got out to walk up the hills. The most striking point, I think, is when he proceeded to point out the route to Susa from Miletus, a straight line. He afterwards explained to us exactly what must have been Aristagoras' conversation with the king of Sparta about the map he had drawn, and he has even drawn the map for us in a way that is, I think, very probably like the bronze plate Aristagoras took with him to try to persuade the king of Sparta to go to Susa, but the king replied that the distance was too great. The interest of the paper was very great at the commencement, and increased. He explained the symmetrical habit of mind of these people, which probably drew them into many errors, but also in various ways got things on a parallel, and so got some verisimilitude in their maps. It had advantages as well as disadvantages. You will all, I am confident, wish me to return a very hearty vote of thanks to Mr. Myres for his very interesting and suggestive paper.

THE SURFACE OF THE SEA AND THE WEATHER.

By H. N. DICKSON.

PROF. OTTO PETTERSSON contributes to the August number of the *Meteorologische Zeitschrift* a further and important instalment of results obtained by the joint labours of Swedish, Norwegian, German, Danish, and British oceanographers in the North Sea and its branches, and in the North Atlantic. Prof. Pettersson deals in this paper chiefly with the meteorological aspect of the question, and discusses more fully than has been possible hitherto the points raised at an early stage of the work, and given in outline by the writer in the *Geographical Journal* for March of the present year. It is clearly shown at the outset how a comparatively small change of temperature in the surface waters of the sea necessarily means a vast quantity of heat imparted to the atmosphere, partly on account of the great specific heat of the water, and partly because cooled particles of water are instantly

removed and made to give place to lighter particles of warmer water. There is thus a double reason why, under normal conditions, the surface of the sea should in winter be maintained at a higher temperature than the land, and so tend to become the home of systems of low barometric pressure, and this altogether apart from its power of supplying these systems with aqueous vapour.

A great deal of evidence is produced to show that in general the regions of relatively warm surface water are indeed regions of relatively low barometric pressure, and the further question then arises as to the relation between the conditions of the surface of the sea and the weather, dependent on the barometric pressure, at different seasons and in different years. From a large number of particular cases where abundant material has been collected by international co-operation, and from long-period averages of observations made at Danish, Norwegian, and Swedish stations, and at the British coastguard stations under the Meteorological Council, it is established almost beyond dispute that where warm oceanic water has from any cause been brought into the North Sea or the Baltic in unusually large quantities in autumn, the weather of the following winter is marked by an unusually large number of cyclones with accompanying mild weather. If, on the other hand, the land streams are stronger than usual, bringing down large quantities of cold fresh water and spreading them widely over the sea-surface, then pressure tends to remain above the average, the cyclones are deflected further to the westward, and the hard cold winter characteristic of steady anticyclonic conditions is the result. The strong contrasts of recent winters, during which the international system of observations was in full swing, afforded exceptionally good opportunities of bringing out this point. The warm winter of 1894 was preceded and accompanied by the presence of vast quantities of warm oceanic water in the North Sea; while in 1895, a winter of intense cold, the southern part of the North Sea was entirely filled with fresh cold waters chiefly derived from the land.

Prof. Pettersson admits that much remains to be done before complete proof of the hypotheses advanced can be obtained. The facts, as at present known to us, will indeed bear no other reasonable interpretation, but in most cases the interaction of cause and effect is so complex that it is often difficult to tell which is which. Every step in the investigation drives one further and further out to sea, where observations become always more and more widely separated; for not until we have a really fairly complete knowledge of the surface currents of the North Atlantic and the Norwegian Sea can we hope to find the cause of the great differences in the distribution of waters nearer home. When the influences controlling these currents are once fully understood, it seems almost certain that a limited number of observations judiciously selected as to time and place, will enable us to forecast with confidence, not the weather for a day or a few days, but the general character of a season, whether the winter is to be mild or severe, and possibly also whether the summer is to be wet or warm.

At the close of the paper published in the March number of the *Geographical Journal*, I was able to state that arrangements had been made for making observations on an extended scale in different parts of the North Atlantic during the years 1896 and 1897. Thanks to the energy and care of the captains and officers of the large number of vessels engaged in the work, more than 1600 samples of surface water have been collected during the first ten months of the period. The greater part of the material thus brought together gratuitously has already been subjected to careful if partial analysis, and if, as seems certain, a similar number of samples can be collected next year, the deficiencies so emphatically pointed out by Prof. Pettersson will have been to some extent made good.

THE MONTHLY RECORD.

THE SOCIETY.

Medals for the Nansen Expedition. — As was announced in the November number of the *Journal*, the Council have decided to award to Dr. Nansen a Special Gold Medal for his recent Arctic expedition. It has also been decided to award silver replicas of the medal to Captain Otto Sverdrup, Lieut. Sigurd Scott Hansen, Lieut. Hjalmar Johannesen, and Dr. Henrik Blessing; and replicas in bronze to the other members of the expedition, viz. Claudius Theodor Jacobsen, Peder Henriksen, Anton Amundsen, Lars Pettersen, Bernhard Nordahl, Ivar Mogstad, Adolf Juell, and Bernt Bentsen.

EUROPE.

Ordnance Survey Maps. — The Departmental Committee on the sale of Ordnance Survey maps has published its report, together with minutes of the evidence given by thirteen witnesses, including Sir Clements Markham, Colonel Farquharson (Director-General of the Ordnance Survey), Mr. H. O. Arnold-Forster, M.P., and a number of map-salesmen and officials. The decision arrived at by the Committee was that the principle of appointing sole agents for England, Scotland, and Ireland, through whom alone maps of the respective countries could be obtained, should be abandoned. The Committee recommends for the future that a single agent should be appointed for the sale of Ordnance Survey maps in London; that a separate agent be appointed for Edinburgh, Dublin, and each of the larger provincial towns, to keep a credit stock of maps, which will be supplied to him at a discount of 25 per cent. off the published price. In addition to this, any book or map seller may order maps direct from Southampton or Dublin, and will be supplied on the same terms as the appointed agents, except that prepayment for orders should be necessary. The Committee further makes the very important recommendation that the Postmaster-General be invited to sanction arrangements for the exhibition of index sheets and specimens of local maps at about a thousand post-offices in small towns and rural districts, so that maps may be ordered through the post-office. It is eminently satisfactory to find that at last there seems a likelihood of the splendid maps of the Ordnance Survey being made easily accessible to the public in all parts of the country.

Bibliography of Germany.*—This is a work of enormous labour, involving an amount of research and compilation out of proportion, we fear, to the utility of the completed scheme—to geographers at least. The bibliography is limited, in the first case, to the titles of books and maps separately published, and the whole class of memoirs published in journals is excluded. Thus almost all the detailed geographical studies of small regions, which form so characteristic and admirable a feature of German geographical work, are left unnoticed. The arrangement also is very unsatisfactory from the standpoint of a geographical student, not comparable for a moment with the admirable clearness of the 'Bibliotheca Geographica,' with which the present work must not be confounded. The five main heads are—Bibliography of the literature of German geography; Land-surveys, maps, and plans; General works on regional geography (*Landeskundliche Gesamtdarstellungen*) and guide-books; Features of the country (including surface forms, waters,

* 'Bibliotheca Geographica Germaniæ. Litteratur der Landes- und Volkskunde des Deutschen Reichs, bearbeitet durch Paul Emil Richter.' Leipzig: Engelmann, 1896. Pp. 842.

climate, vegetation, animal distribution); and Inhabitants. The main subdivisions are also non-geographical, and the regional classification takes quite a minor place in the arrangement. The index, which might, if well done, atone for a confusing classification, is also unsatisfactory, the names of authors not appearing, and very few place-names being recorded in it.

Canton Zurich: Surface Changes since the Middle of the Seventeenth Century.—In the October number of *Petermanns Mitteilungen*, Dr. Edward Brückner has a note on this subject based on a comparison, made at his instigation by Mr. H. Walser, of the maps of the present day with an excellent map by J. C. Gyger, on the scale of 1:32,000, belonging to the year 1667. The chief results ascertained by this comparison are a great reduction during the period of the area occupied by lakes, many of those existing in 1667 being now extinct, others contracted in dimensions, a diminution of about 10 per cent. in the forest area, and an increase of the area under vineyards by about 25 per cent. Of the 149 lakes on Gyger's map (most of them, it is true, under 25 acres in extent), 73 have altogether disappeared from various causes.

The Arendsee in the Altmark.—Dr. W. Halbfass, whose observations on the lakes in the basin of the Lech are noticed on pp. 198–9 of vol. vii. of the *Journal*, has contributed to the eighth number of *Petermanns Mitteilungen*, 1896, a monograph on the Arendsee, which lies in the northernmost corner of the Prussian province of Saxony. It lies quite isolated 50 miles from Lake Schwerin, the nearest lake of considerable size east of the Elbe. It has neither inlet nor constant outlet, the artificial channel connecting it with the Jeetze, and through it with the Elbe, only occasionally serving as a means of discharge for surplus water. Sometimes the water flows the other way. The lake has an area of 2·3 square miles, and lies at the height of 77 feet above the level of the Baltic, in a district which is for the most part a nearly level sandy heath; but the contours of its bed (which are shown on a map accompanying the monograph) are quite out of correspondence with such surroundings, the depth being very variable at different parts, and unusually great (maximum 162 feet) in proportion to the size of the lake. This is explained by the history of the lake. It is generally stated that the lake owed its origin to a subsidence of the ground in 822, and was extended by another subsidence in 1685, but Dr. Halbfass points out that the documents from which we obtain the information as to the former subsidence speak of a lake already existing at the spot, and this original lake he believes to date back to the diluvial period, and to be one of those formed by the water derived from the melting of the retreating ice. The monograph also gives the results of numerous observations on the temperature of the water, its transparency, and other matters.

The Occurrence of Yews in North-West Germany.—At present firs and yews are regarded as absent throughout the whole of North-West Germany, but on this subject Dr. Oskar Drude has an interesting note in the September number of *Petermanns Mitteilungen* with reference to two recent discoveries there due to Mr. H. Conwentz, director of the Museum of Natural History at Danzig. One of these is that of the remains of a wood composed of firs, yews, oaks, birches, and alders, in a bog between Hanover and Burgdorf, near the small village of Stelle. Among about fifty stems of yews, some lying, some upright, specimens were seen measuring more than a metre round. The other discovery, or rather re-discovery, was that of a clump of living yews in the Krehlinger Bruch, near Walsrode, north of Hanover, the existence of which was mentioned in the literature of forestry as far back as 1865. These discoveries, says Dr. Drude, show that the hard and fast lines that have been drawn as the limits of individual trees in North-West Germany are of very little value, and the method of determining such lines merely by researches in documents, of still less.

ASIA.

British Travellers in Tibet.—A Reuter's telegram from Simla, on November 11, announced the return to Leh of Captain Deasy, who set out last April on a journey across Tibet for the purpose of exploring the upper courses of the rivers of Indo-China (*supra*, p. 296). Deficiency of means of transport is assigned as the cause. The same telegram reported the arrival at Lan-chau of Captain Welby and Lieut. Malcolm, who also left Kashmir in April, but from a private letter we learn that they had by that time already reached Shanghai in safety. Details of their journey are not given, but as it had been their intention to avoid routes already used by Europeans, whilst they had with them a trained Indian topographer, it is to be hoped that some good exploring work has been accomplished.

The Khangai Mountains in North-West Mongolia.—M. D. Klements, who has been sent out by the Siberian Geographical Society for the exploration of the region between Urga and Ulyasutai, and especially of the great Khangai mountains, which run, as is known, west-north-west to east-south-east, in the latitude of 47° and 48° N., made two attempts to ascend the Otkhon-tengri peak (situated 35 miles east of Ulyasutai, and also named Ochir-vani). Both attempts proved unsuccessful, but M. Klements could approximately estimate the height of that mountain at between 13,000 and 14,000 feet. He found also a great glacier on the western slope of the Otkhon-tengri, and discovered many traces of former volcanic activity. Wide spaces in this part of the Khangai range are covered with basaltic lavas, and two small volcanoes, long since inactive, were discovered.

Sven Hedin's Discovery of Northern Lob-nor.—The last news from Dr. Sven Hedin was from Khotan. After having left Kashgar on December 14, 1895, he went to Khotan, *viâ* Yarkand and Kargalik, and from Khotan he made a very interesting excursion into that part of the Gobi which lies near to Khotan, and is known as the Takla Makan. An account of an earlier journey appeared in the *Journal* for September and October. Ruins of ancient towns were said to exist in that desert, and Sven Hedin really found the ruins of two towns, one of which is remarkable for its big size and the purely Indian style of its architecture. Reaching next the shores of the Keria river, the expedition followed its banks northwards, and came across a small nomad stem, so devoid of all communication with the outer world, that they did not know whether Yakub Beg is still their ruler, or whether they belonged to China. Large herds of the wild camel were met with, and three specimens secured. After a further eight days' march, Sven Hedin reached the other end of the desert. Therefrom he went to the region where the Chinese geographers place Lake Lob-nor, which lies to the north of Lob-nor which was first visited by Prjevalsky, and has since gone under that name. A series of lakes and traces of an immense now dessicated lacustrine basin were really found, as well as extensive forests and thickets, which continue to grow round the bottom of the old lake, while no forests are found around the southern lake, or Prjevalsky's Lob-nor. The lakes discovered by Sven Hedin on the spot which is marked as the position of Lob-nor on the Chinese maps, were, however, refilled with water no more than nine years ago, the water coming from the Tarim. Its bed was obstructed some time ago by sand, and consequently the river began to discharge its water further northwards. The two groups of lakes—the one discovered by Prjevalsky and the one now discovered by Hedin—are thus in mutual dependency, and the one dries up when the other is filled with water.

The Variations in the Lacustrine District of Lob-nor.—In connection with the above note, it may be stated that Dr. Sven Hedin contributes to the ninth number of *Petermanns Mitteilungen*, 1896, a series of nine maps, illustrating changes that have taken place, or may be inferred to have taken place,

mainly in recent years, in the lakes that form the ultimate receptacles of the waters of the Tarim, the Konche-daria, and the Cherchen-daria. Two of the maps, representing the probable state of things about 175 years ago, are based on information obtained from an aged chief whom the explorer met at Abdal. The changes are not difficult to account for. The basin of the Tarim is likened by Dr. Hedin to a spoon, the deeper end of which is in the east. This is due to the fact that that basin is surrounded on all sides except the east by mountain chains, from which flow a number of streams, most of which on the north and south sides are not powerful enough to reach the main river, but dry up in the sands. The result is the accumulation of cones of deposit round the basin. The (Yarkand) Tarim, however, reinforced chiefly by the Aksu-daria, the Khotan-daria, and the Konche-daria, carries a sufficient amount of matter in suspension to deposit considerable quantities of mud at its terminus, and consequently the eastern end of its basin is gradually being brought to a nearly dead level, so that it is not at all surprising that changes should take place there in the ultimate distribution of its water. These changes are assisted by the dust-storms that prevail in the region. Throughout the basin the prevailing winds are from the east or north of east, east-north-east winds being the most frequent, especially in the spring, when they commonly blow with great violence. They are then known as *kara-buran*, or "black storms." During Dr. Hedin's visit one such storm raged from the 9th to the 21st of April, with only two days' interval, and another from the 25th to the 28th without the slightest intermission. This wind carries not merely atmospheric dust, but also drift-sand, thus causing the sand-dunes to move westwards. The maps show that the main receptacle of the waters of this basin appears to oscillate from north to south and back again. The Lob-nor of Prjevalsky (1876–1885) represents two minor lakes, shown in a Chinese map of 1863, the main body of water being then further north. At the time of Dr. Hedin's visit (April, 1896) the two large lakes forming the Lob-nor of Prjevalsky were represented only by a shrivelled and shallow basin (about 8 inches deep) and a considerable extent of marsh, with occasional sheets of open water, while a larger body of water was being formed in a more northerly part of the course of the Tarim above the confluence of the Cherchen-daria. At low water these lakes are slightly brackish, the shore lagoons, on the other hand, very salt; but it need not surprise us that at high water (September—October) the water of the lakes is quite fresh, seeing that these lakes are constantly being re-formed in different situations.

The Rainfall of China and Korea.—To the ninth number of *Petermanns Mitteilungen*, 1896, the editor, Dr. Supan, contributes three tables with explanatory notes relating to the rainfall of China and Korea. In the first table all the available material has been made use of, but in the other two only those stations have been included for which returns were available for the same period of six years (1887–92). The principal result of the examination of these tables, according to Dr. Supan, is that while in north and south China the markedly monsoon character of the rainfall is exhibited in the great preponderance of summer over winter rains, at the stations of middle China (from the lower Yangtse-kiang to Amoy) the winter rainfall is more considerable, though even there not amounting to half that of the summer half-year. On this ground Dr. Supan feels compelled to dissociate the eastern from the southern Asiatic monsoon region, which he has represented as one in the rainfall map in the second edition of his *Physische Erdkunde*.

AFRICA.

Mr. C. W. Hobley's Journey around Mount Elgon.—Mr. C. W. Hobley, in January last, succeeded in encircling the whole of Mount Elgon, named after a

tribe, the Elgonyi, on its southern slope, but known to the Walako as Masawa Tukul. Leaving Mongichi's on January 9, he first crossed the fine open country of the Wakamuni, and then entered the thickly peopled valleys of the Wavoto and Wakoko. This district is a succession of precipitous hills, all clothed from foot to summit with luxuriant banana plantations, intersected by numerous deep valleys of exceptional fertility. Crossing the Busano mountain by a pass at a height of 6700 feet, he descended into a tract of fertile rolling valleys, in which bananas grow with such profusion that large quantities ripen and rot in the shambas ungathered. The small tribes inhabiting this favoured land had never seen any coast people, and are entirely unacquainted with cloth or beads; a few cowries, however, are imported from Unyoro. On reaching the north-west corner of Elgon, the vast level plain to the north and the chain of lakes became distinctly visible. The Wakumama, on these lakes, constantly raid the inhabitants of the mountain. The northern slope is inhabited by Mbai, Sor and Savei, who are Masai. The Savei are frequently visited by Swahili caravans, on their way north to Ngaboto and Turkana, and are consequently more civilized than their neighbours. The east side of the mountain is thickly wooded above 7000 feet, and entirely uninhabited. Before again reaching Mongichi's, Mr. Hobley traversed the district of the Elgonyi, who are closely allied to the Walako.

The East Africa Protectorate.—In the August number of the *Journal* (p. 174) we alluded to the extension of the limits of the Uganda Protectorate in the direction of the upper Nile. This has been followed by an official notice published in the *London Gazette* of September 1, by which it is announced that all the territory in East Africa now under the protectorate of her Majesty, except the islands of Zanzibar and Pemba and the Uganda Protectorate, are included in one administration, known as the "East Africa Protectorate." It includes all the islands adjacent to the coast between the Jub and Umb rivers.

The Italians in Abyssinia.—The treaty of peace signed at Adis Abeba, the Emperor Menelik's Shoan capital, on October 26, is far more favourable to Italy than could have been expected. The treaty of Uchelli (May 2, 1889, with a supplementary convention of February 6, 1891) is abrogated, and the absolute independence of Ethiopia recognized; but Italy, far from losing territory, actually receives an accession. The boundary of 1889–1891 commenced at Mount Mungabo, near Annesley bay, and passed to the south of Halai, Saganeiti, and Debarca. That of the recent treaty lies about 35 miles further south, being formed by the rivers Mareb, Belesa, and Muna. The exact line is to be demarcated on the spot by delegates of both governments, one year from the date of this treaty. Italy, until this definite delimitation of the frontier, engages not to cede territory to any other power. A commercial treaty is also to be concluded. By a convention signed at the same time, the Italian prisoners now in Shoa, about 1500 in number, will be forwarded to Harar and Zeila, the Italian government paying an equitable sum for the expenses incurred on their behalf. By this treaty Italy retains her colony of Eritrea and the Somal coast, but Abyssinia can no longer be looked upon as an Italian Protectorate, nor even as lying within an "Italian sphere."

Lieut. Hourst's Voyage down the Niger.—News has been received that Lieut. Hourst and his companions, who set out from Timbuktu on a voyage down the Niger in January last (*supra*, p. 72), have descended the whole course of the river to the sea, at which they have arrived by the Forcados mouth.

The Lakes in the Timbuktu Region.—In our July number (p. 72) we alluded to the survey by Commandant Réjou of a new lake (Dauna) south of Lake Faguibine. From a sketch-map published in the *Comptes Rendus* of the Paris Geographical Society (1896, p. 177), it appears that it is (at low water) a narrow lake about 12 miles long, connected with Lake Faguibine by a channel which issues near its eastern extremity. At high water the lake overflows for a long distance towards the west and south, becoming 26 miles long by 4½ wide. North of Lake Faguibine (and connected with it by a channel) still another lake (that of Bonkor) has been discovered, measuring about 10 miles by 3, while further still in that direction another lacustrine depression has been reported by the natives.

The French Sudan Railway.—It has been decided to continue the construction of this railway from the Senegal to the Niger in accordance with the original design. The line reached Bafulabe near the confluence of the two upper branches of the Senegal in 1888, though the hasty manner of its construction necessitated subsequent improvement. It has, till the present, remained stationary at that point; but work has now been recommenced, and a bridge over the Bafing near its junction with the Bakhoi has already been built. A useful sketch of the history of the enterprise appears in the November number of the *Bulletin du Comité de l'Afrique Française*.

A Port and Railway for German South-West Africa.—Attempts have lately been made to establish a port in German territory as the outlet for Damaraland, and, according to recent accounts, Walfish Bay seems threatened with a serious loss of trade (*Deutsche Kolonialzeitung*, November 7, 1896). The new station is at the mouth of the Swakop, or Tsoakaub, and goes by the name Swakopmund. It already numbers twenty European houses, besides many native huts. The route thence to the interior is said to be much easier than from Walfish Bay, being less obstructed by shifting sand-dunes. For this reason the waggons from the interior have begun to take this route, and the trade of Swakopmund is now double that of Walfish Bay in 1893. The facilities for landing at the mouth of the Swakop are discussed in the *Kolonialblatt* of August 1, and though it is allowed that at present it is far behind the Bay in the security it affords to shipping, the opinion is expressed that a mole or iron pier, at which ships could load or unload cargo, could be constructed at a comparatively small cost. Granite for the building of a mole is present on the spot, while other advantages of the site are the good supplies of water and fodder for cattle. A railway from Swakopmund to Otjimbingue and Windhoek is said to be urgently needed in the interests of the colony.

AMERICA.

Venezuela: Vegetation and Cultivation.—The ninth number of *Petermanns Mitteilungen*, 1896, contains the third and apparently the last of the series of maps relating to Venezuela compiled by Dr. W. Sievers, this one showing by seventeen signs the distribution of the natural vegetation and the leading cultivated products. The map thus sheds interesting light on the distribution, and the opportunity presented for the further spread of population. Among the more noteworthy features of the map in this respect are the coloured signs showing the extent of sandy steppes and of scrub (*monte*), including the prickly vegetation characteristic of arid regions in tropical countries, neither of these features having been represented in Codazzi's

map. The sandy steppes are met with over a large area in the east of the republic north of the Orinoco, between about 63° and 66° W., and mainly south of 90° N., though this limit is exceeded about 64° W., and possibly elsewhere, since the data are insufficient for determining its north-western limit towards La Pascua. The scrub and prickly vegetation is very extensive in the north, especially on the southern and western sides of the mountains, and embraces nearly all the peninsula of Paraguana, as well as the Colombian peninsula of Goajira and the islands (including the Dutch West Indies) off the Venezuelan coast.

Prof. Sievers's Work on Venezuela.—Prof. Sievers calls our attention to the notice of his work on Venezuela inserted in the September number of the *Journal*. In the first place, it appears that a slip was inserted in the work, stating that a map would shortly follow—a statement which, it is unnecessary to say, had escaped the notice of the reviewer when commenting unfavourably on the absence of a map.* The second point is the statement that no indication is given as to the source whence the population statistics are derived, whereas Prof. Sievers has mentioned, at p. 106, that they are based on the census of 1891.

Population of the Argentine Republic.—The October number of *Petermanns Mitteilungen* contains some of the preliminary results of the second census of the Argentine Republic, held on May 20, 1895, from which it appears that the population of the provinces and territories was then as given below :—

Provinces, etc.	Population.	Increase per cent. per annum since the first census (Sep. 16, 1869).	Provinces, etc.	Population.	Increase per cent per annum since the first census (Sept. 16, 1869).
Buenos Aires Capital	663,854	9·9	Prov. Jujuy	49,543	0·9
Province	921,225	7·8	„ Salta	118,138	1·3
Terr. Misiones ...	33,005	—	„ Tucuman ...	215,693	3·8
Prov. Corrientes ...	239,570	3·3	„ Catamarca ...	90,187	0·5
„ Entre Rios ...	290,994	4·5	„ La Rioja ...	69,228	1·6
Terr. Formosa ...	4,829	—	„ San Juan ...	84,251	1·5
„ Chaco	10,280	—	„ Mendoza ...	116,698	3·1
Prov. Santa Fé ...	397,285	13·4	Terr. Neuguen ...	14,517	—
„ Santiago ...	160,445	0·8	„ Rio Negro ...	9,300	—
„ Córdoba ...	351,745	2·6	„ Chubut ...	3,748	—
„ San Luis ...	81,155	2·0	„ Santa Cruz ...	1,058	—
Terr. Pampa	25,765	—	„ Tierra del Fuego	477	—

The total population, including 60,000 estimated to be unenumerated, and, say, 30,000 Indians, is returned at 4,043,000. The very rapid rate of increase of population in the province of Santa Fé, much higher than that of any of the provinces of the Dominion of Canada between 1881 and 1891 (highest Manitoba, 9·5), or any of the provincial districts of the North-West Territories of Canada between the censuses of 1885 and 1891 (highest Alberta, 6·9), and among the United States exceeded only by North Dakota (17·37), and Washington (16·62) in the period 1880–90, is a striking indication of the recent extension of wheat-cultivation in that province. Besides the capital, there were in Argentina in May, 1895, fifteen towns with a

* The map has since been received, and shows clearly, on the scale of 1 : 1,000,000, the physical features of the mountainous districts of North Venezuela, between Coro and the peninsula of Paria. It is based on Prof. Sievers's own surveys, his routes being shown in red.

population of upwards of 10,000, viz., Rosario, 92,412; La Plata, 43,565; Córdoba, 42,783; Tucuman, 34,297; Mendoza, 28,803; Paraná, 23,922; Santa Fé, 23,818; Salta, 16,672; Corrientes, 16,058; Chivilcoy, 14,632; Gualeguaychu, 13,003; Concordia, 12,449; San Nicolás, 12,281; San Juan, 10,410; Barracas al Sud, 10,185.

The New Boundary Treaties between Chile and Bolivia and Argentina.—Dr. Polakowsky communicates to *Petermanns Mitteilungen*, No. 9, 1896, the main particulars of these two treaties, the former signed on the 1st, and the latter on the 7th of May, 1896. The treaty with Bolivia converts the truce of 1884 into a definitive peace, and accordingly finally cedes to Chile the whole of the present province of Antofagasta. That with Argentina hardly provides for a final settlement of the matters in dispute. The first article declares that the operations of demarcating the boundary between the republics of Chile and Argentina in accordance with the treaties of 1881 and 1893 are to be continued in the Cordillera de los Andes as far as 23° S., and the frontier line from that parallel to 26° 52′ S. is to be settled by both governments and that of Bolivia, which is invited to take part in the settlement. But the new treaty does not state whether the line to be taken as the Cordillera de los Andes is that of the Cordillera Real running east of the Puna of Atacama, where the frontier is now usually drawn (as, for example, in the map of South America in Stieler's Handatlas), or along the crest of the chain running south from the volcano of Licancour to the west of that Puna, so as to transfer the Puna to Argentina. With regard to the boundary south of 26° 52′ S., it is provided that any disputes that may arise between the members of the commissions appointed to set up the boundary-stones, and cannot be settled by a friendly agreement between the governments of Chile and Argentina, are to be decided by the Government of her Britannic Majesty.

The Swedish Expedition to Tierra del Fuego.—The scientific expedition despatched in 1895 to Tierra del Fuego under Dr. O. Nordenskjöld, mainly at the expense of Baron Oscar Dickson, completed its work during the first half of 1896. Some account of the geographical, geological, and botanical results was laid before the "Deutschen Wissenshaftliche Verein" at Santiago (Chili) in July and August, by the leader and Herr P. Durén respectively, and a short report appears in *Globus* (lxx. No. 18), while Dr. Axel Ohlin, zoologist to the expedition, briefly describes his own special work in the September number of *Natural Science*. The main island of Tierra del Fuego, to which the observers devoted special attention, is divided by Dr. Nordenskjöld into three zones, viz. (1) the southern mountainous region, covered in its lower parts by dense forests; (2) a lower and more level zone in the centre, in which only the tops of the hills are forest-clad; and (3) the northern treeless zone. The three main lines of heights (of which the two southern, formed of crystalline schists, are divided by the longitudinal depression of Admiralty sound, and the lately discovered Lake Fragnano) have, individually, the character of plateaux, cut up by the deeply eroded valleys of the streams. The two northern zones are composed of tertiary formations covered with quaternary deposits, identical with the ground moraine of the old glacial region of North Europe. The vegetation of the eastern dry, and the western moist, regions is sharply contrasted, and between them occurs a zone, marked in part by a peculiar flora, and in part by plants common to the two main divisions. The zoological work of Dr. Ohlin has thrown new light on questions of distribution relating to those regions. Punta Arenas on the northern shore of the Strait of Magellan is placed just on the meeting-line of the eastern and western fauna. The strait does not, as was thought by Darwin, form a boundary between two distinct regions, for many eastern Patagonian

forms were found in the eastern part of Tierra del Fuego. A small lizard was found as far south as Rio Grande, in 53° 50′ S., which is the most southerly spot where reptiles have yet been discovered. The ostrich (Rhea) and puma, however, do not pass south of the strait. In the western moist region the great southward extension of originally sub-tropical forms is remarkable.

AUSTRALASIA.

The Calvert Expedition in Western Australia.—Telegraphic news was received early in November of the arrival at the Fitzroy river, in the north of Western Australia, of the expedition fitted out early in the present year by Mr. A. F. Calvert, for the purpose of exploring the principal unknown areas in the western half of Australia. Unfortunately, the party only got through after experiencing great hardships and abandoning the scientific collections made *en route*. Two members of the expedition (Messrs. C. A. Wells and J. W. Jones) are also reported missing, but hopes are entertained of their rescue. From information communicated by Mr. Calvert, we obtain the following details regarding the general plan and early stages of the expedition. The leader is Mr. L. A. Wells, who had previously done good work on the government survey of the boundary between Queensland and South Australia. His cousin, Mr. Charles A. Wells, a good surveyor, is second in command, while the scientific work and photography is entrusted to Messrs. G. A. Keartland and J. W. Jones. The party left the coast at Geraldton, a little south of the Murchison river, the main objective being the unknown tract lying between the routes of Giles and Warburton, which it was proposed to cross in a northerly direction towards the north-west coast. From Derby, near the mouth of the Fitzroy, it was proposed to start eastwards for Powell's Creek on the trans-continental telegraph line, whence the more eastern portions of the unexplored areas would be traversed by a south-westerly route to the West Australian goldfields. It is, therefore, only the first section of the proposed exploration which has yet been accomplished. The last previous news which had been received was dated July 15, from the neighbourhood of Lake Way, whence a start was to be made the following day for Lake Augusta (25° 50′ S., 122° 28′ E.). The rains had been very heavy in that region early in the year, and there were several miles of shallow lagoons of fresh water. Further details will be awaited with interest.

The German Expedition in New Guinea.—Letters from Dr. Lauterbach, the leader of this expedition, are published in the *Verhandlungen* of the Berlin Geographical Society (1896, p. 360), giving details respecting its progress down to June 26. After a preliminary trip to the Oertzen mountains, during which the highest peak (about 3600 feet above the sea) was climbed by Dr. Kersting, the final start was made from Stephansort, at the head of Astrolabe bay, on May 30. Besides the three Europeans, the expedition consisted of four Malays and forty Melanesians. Four horses and fifty goats were also taken. The route at first led again in the direction of the Oertzen mountains, but, a good sized river (the Gogol, known near the sea as the Elizabeth) having been reached, its course was followed in a south-west direction through a gap in the mountains. The country was well peopled, and provisions were easily obtained. The path became very rough, and the horses' hoofs suffered severely. After reaching the source of the river, Lieut. Tappenbeck and Dr. Kersting returned to the coast for a further supply of provisions, whilst the leader climbed a peak, which gave him some view towards the interior. Many forest-clad ridges rose one behind the other, an important range bounding the view to the west, whilst a high mountain was also visible in the north, and another bearing west-south-west by west. The latter seemed between

13,000 and 16,000 feet high. A river was discovered flowing south-west and west, which rapidly increased in size from the junction of other streams. In its neighbourhood a station was erected, 60 miles from the coast, and on the receipt of the last instalment of supplies, it was intended to push on in a southerly direction, and attempt the ascent of one of the highest peaks. According to a telegram from Soerabaya received at Berlin early in November, the substance of which has been communicated to us by the Foreign Office, the expedition has returned in safety to the coast, having accomplished a satisfactory piece of exploration. The river above alluded to was followed for 200 miles, and proved to be navigable, and to flow through a well-peopled, fertile plain. The question of its termination will be of much interest. This is the first time that a well-peopled tract has been discovered in the interior.

Murder of an Austrian Geologist on Guadalcanar.—Baron von Foullon-Norbeck, geologist attached to the staff of the gunboat *Albatross*, which left Austrian waters in 1895 for a scientific voyage round the world, was murdered by the natives of Guadalcanar, in the Solomon group, in August last (*Petermanns Mitteilungen*, p. 243).

The Ellice Islands.—An account of these islands, which were annexed along with the Gilbert islands by the British in 1892, is contributed by a correspondent to the *Sydney Evening News*. The group lies to the north of the Fiji islands, between 5½° and 11½° S. The inhabitants are a quiet, peaceable race, very different from the proud, restless, quarrelsome, and warlike Gilbert islanders. The southernmost member of the group, Sophia island, or Rocky Independence, called by the natives Ulakita, is the only one high enough to be seen from a ship at the distance of 20 miles. A few years ago it was uninhabited, but it now contains the labourers on a guano deposit worked by an American. About 80 or 90 miles further north lies Nukulailai, or Mitchell island, a perfect atoll, composed of thirteen low islets, with an impassable reef enclosing a lagoon 5 miles long by 3 miles broad. Thirty years ago this atoll, which is thickly covered with coconut palms, had four hundred inhabitants, but nearly three hundred of them were carried away by kidnappers from Peru to work on the guano-fields of the Chincha islands, where nearly all of them perished. Now the inhabitants number about 120, all Christians. A few leagues to the north-west lies Funafuti (Ellice), a chain of thirty-five islands, enclosing a large lagoon, to which there are two good entrances, one in the south-west, the other in the north-west. The total number of the inhabitants is about 400, all on the main island, Funafuti. On this and the other members of the atoll, millions of coconut palms ripen their fruit, only to rot, owing to the refusal of the natives to allow Europeans to settle on one of the islands and prepare copra. The total value of the imports and exports of all the Ellice islands in 1894 was nearly £4900. It was on the atoll of Funafuti that the boring experiments described in the following note were made.—*Petermanns Mitteilungen*, 1896, No. 9.

The Coral Reef Boring Expedition.—Letters received by the Royal Society from Prof. Sollas announce the failure of the boring operations attempted by the staff of the *Penguin* on Funafuti island, one of the Ellice group in the Western Pacific. On two separate attempts, it seems, the apparatus was choked by a kind of quicksand. The sand apparently contained boulders of coral, which does not form solid rock, but seems to resemble a coarse sponge with wide interstices. Valuable observations were, however, made regarding the fauna, flora, and ethnology of the group, while the complete series of soundings obtained by Captain Field is expected to throw new light on the nature of coral reefs (*Nature*, September 24).

POLAR REGIONS.

The Cornell Expedition to Greenland.—A recent number of *Science* contains some particulars relative to the Cornell Expedition to Greenland, by Mr. Ralph S. Tarr. The Cornell party accompanied Lieut. Peary on the steamer *Hope*, the main object of the expedition being to study the geology of a small area in some detail; but collections of plants, insects, marine invertebrates, and birds were also made. The principal place of observation was the Nugsuak peninsula, Western Greenland, where the party remained from August 7 to September 7. The main geological results of the expedition may be briefly summarized as follows: At the island of Turnavik, on the Labrador coast, there is abundant evidence of recent glaciation. That part of Baffin Land bordering Hudson Strait, in longitude 70°–71°, has all been glaciated up to an elevation of 600 feet. Both at Big island and on the main Baffin Land evidence of very recent elevation is found to a height of 270 feet above the sea. The Nugsuak peninsula referred to is situated in lat. 74° 7′, about 80 miles north of Upernavik. Its highest point is 2500 feet, and in many places its elevation is over 1000 feet. Wilcox head, at the end of the peninsula, has an elevation of 1400 feet, and the sea near by is more than 100 fathoms in depth. At the south-eastern base of the peninsula is a large glacier, named the Cornell glacier, and on the northern side is the Wyckoff glacier. The latter is nearly stagnant. Proofs were afforded of a retreat and advance of the Cornell glacier at some recent time, although there was evidence that the glacier is now engaged in a rapid withdrawal. This very recent retreat, the author points out, is a part of a general withdrawal of a vast ice-sheet, which extended outward beyond the Duck islands, a distance of no less than 32 miles from the front of the Cornell glacier. He is of opinion that, in this part of Greenland at least, the present glaciation is a shrunken remnant of a former greater sheet, the western limits of which cannot be drawn.

GENERAL.

Acclimatization.—In a pamphlet reprinted from *Appleton's Popular Science Monthly* (March to April, 1896), Mr. William Z. Ripley discusses the question of acclimatization, both from the point of view of the possibility of adaptation to changed climatic conditions on the part of the human race generally, and from the more special standpoint of the possibility of the colonization of the tropics by the races of Europe. The article is evidently the outcome of much careful study, and the very copious references to authorities will be most useful to all who wish to enter more deeply into the subject. In dealing with the more general side of the question, the writer points out the many factors which have to be taken into consideration before a conclusion can be arrived at. Among these are included such points as the tendency of a change of residence to upset the regular habits of the colonist; the predisposition of particular races to certain diseases (*e.g.* the Negro is especially subject to consumption and the affections of the lungs); and the effects of intermarriage between races, which introduces a completely new element into the question. On the last head facts may be adduced both in support of and against the idea that half-breeds are better able to resist climatic changes than unmixed races. The chief elements of climate, in order of their importance, are humidity, heat, and lack of variety. Supposed instances of successful acclimatization, such as that of the French in Algeria, lose their force if the first and greatest obstacle, excessive humidity, is absent. Heat is chiefly important as indirectly causing and generally accompanying humidity. Variety of climate in the tropics always affords relief, as at Singapore, where malaria is completely unknown, owing to the effect of the land and sea breezes. Altitude is largely beneficial through the daily and

seasonal variations which accompany it. With regard to the acclimatization of Europeans in the tropics, the writer lays stress on the rise of temperature of the body which takes place on the first arrival of the new-comer, and which accentuates the difference which already exists between the European and some other races, notably the Negro. He thinks that with the subsequent fall of temperature, comparative immunity from tropical diseases may ensue. A decided lowering of temperature can be effected only after long ages, and though much may be done to mitigate the evils of change of climate, we cannot expect complete acclimatization to be possible within a limited period. A gradual adaptation on the part of the races which show most aptitude for thriving in the tropics—those of South Europe —might be possible; but, as this would involve a general southward shifting of population, political reasons would of course stand in the way. Nevertheless, the writer holds this to be the only course likely to produce a new immune type in the regions of the equator.

OBITUARY.

Friedrich Simony.

Friedrich Simony, the *doyen* of Austrian geography, died on July 20 last at St. Gall, in Upper Styria, aged 83. Born at Hrochonsteinitz, in Bohemia, on November 30, 1813, he in 1835 deserted the pharmaceutical studies which had brought him to Vienna, and devoted himself to natural science. His scientific and artistic labours in the Alps, especially in the Dachstein region, began in 1840, and this work occupied much of his attention till the close of his life. He was appointed custodian of the museum at Klagenfurt in 1848, and in 1850 became geologist to the then newly established Geologische Reichsanstalt, making a geological survey of the Salzkammergut in that capacity, which was remarkable alike for its scientific insight and artistic skill.

Simony's untiring energy may be said to have indirectly brought about the creation of a special geographical department in the Vienna Hochschule, and in April, 1851, he was appointed first ordinary Professor of Geography in the University of Vienna, where his teaching was remarkable for the introduction of graphic methods which have since come into more or less general use. Simony now extended his activities in the field over a great part of the Eastern Alps, and effected numerous improvements in scientific map-drawing, some of which have been adopted in the publications of the American Geological Survey. At the same time, he began the collection of educational material at the Vienna Geographical Institute, which has gone on increasing in the hands of his successor, Prof. Penck. In 1885, in conformity with state regulation, he retired from his official position, receiving the title Hofrath, and devoted himself to the completion of his great work on the Dachstein. Simony was almost wholly self-taught, and his homely manner and almost impatient earnestness of purpose, together with his marked preference for the pencil rather than the pen in publication, prevented his early receiving the recognition he deserved, and it was only in later years that his personality became known outside his own immediate circle.

Lieut. Edward D. Young, R.N.

One of an earlier generation of African explorers has passed away in the person of Lieut. E. D. Young, whose name became known some thirty years ago in association with that of Dr. Livingstone during the early exploration of the region

of Lake Nyasa. Born in 1831, he entered the Navy at an early age, and gained his first experience of East Africa as gunner of the *Gorgon*, engaged in the repression of the slave-trade on that coast. In this capacity he did good service in connection with the capture of Arab dhows. During Dr. Livingstone's second expedition to the Zambesi, Mr. Young was in charge of the *Pioneer*, a small steamer sent out in 1861 to assist in the exploration of the Zambesi, Shire, and Rovuma. Reports of Dr. Livingstone's death having been brought to the coast by deserters from his party during his last expedition, Mr. Young was chosen (in 1867) to lead an expedition for the purpose of inquiring into the truth of the story, and by careful investigations in the neighbourhood of Lake Nyasa, he was able to prove it an entire fabrication. After Livingstone's death, Mr. Young again led an expedition to Lake Nyasa in behalf of the Free Church of Scotland, founding the station of Livingstonia on its shores, and for the first time revealing the northward extension of the lake beyond the point reached by Livingstone and Kirk. He also discovered the Livingstone mountains which bound its north-east shore. The account of this expedition was published in 1877 under the title 'Nyassa.' After his retirement from the service in 1891, Mr. Young had lived at Hastings, where he died on November 4. He became a Fellow of our Society in 1891.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1896-97.

First Ordinary Meeting, November 10, 1896.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

The election of the Right Hon. the Marquess of Salisbury was announced.

Opening Address by the President (see p. 541).

The Paper read was :—

"The Jackson-Harmsworth Expedition and the story of the Last Year's Work." By Arthur Montefiore Brice.

Second Ordinary Meeting, November 23, 1896.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Rev. George Cantrell Allen; William Henry Ambrose; Victor De Costa Andrade; Jervoise Athelstane Baines, C.S.I.*, (I.C.S. *retired*); *John William Bickle; Arthur Bignold; Captain Arthur Blewitt, 2nd Batt. King's Royal Rifles; Rev. Thomas George Bonney, Professor of Geology in University College, D.Sc., LL.D., F.R.S.; Captain Edmund Bourke, R.N.* (*retired*); *Major G. F. Browne, Northampton Regiment, D.S.O.; Major Maurice Alexander Cameron, R.E.; Alexander Campbell, F.G.S. of Victoria; Roderick Campbell; Lord Edward Cecil; John Kirk Child; William Algernon Churchill, H.M. Consul, Mozambique; Captain Ralph Patteson Cobbold, 7th Batt. King's Royal Rifles; Eyre Coote; Oswald Bruce Cuvilje; Richard Harding Davis; William Dawson; Richard Sidney Dendy; Fredrik Anton Dessen; Thos. Hoistendahl Dessen; Captain William Evans; Alfred Joseph Faulding; Colonel Charles A. Wynne Finch; Lieut.-Colonel Hy. Edward Gaulter* (*late 37th, the North Hampshire Regiment*); *Sir Gervas Powell Glyn, Bart.; Harrison Hodgson, M. Inst. C.E.; Lieut.-Colonel Leonard Howard L. Irby; Thomas Henry Ismay, J.P., D.L.; William James Johnston; John Joss; A. Colenso Kessell; Charles R. W. Lane; L. Lindley-Cowen; Major Wilford N. Lloyd, R.A.* (*retired*); *Hon. E. Douglas Loch; Lord Lovat; P. V. Luke; Lieut.-General Arthur Lyttelton Lyttelton-Annesley; Sir James Lyle Mackay,*

K.C.I.E.; James F. McDougall; Major-General St. Laurence McGuire; Hon. Bernard C. Maxwell; Frank Stanley Milward; Captain Philip Montagu, late 12th Lancers; Alexander Moring; M. Neustadt; Charles E. Pearson; Hugh Leybourne Popham; Howard Priestman; Frederick P. Pullar; William F. Regan; Baron Ferdinand Rothschild, M.P.; Edward Russell; John Shillito, J.P.; Hugh Smiley, J.P.; Captain P. B. Smithe, 17th Lancashire Regiment; Rev. Thomas Stephens; Harold Swithenbank; Thomas Michael Thackthwaite; Captain Franz K. Thimm; Rev. Joseph Llewelyn Thomas; Henry Vale Trapp; Aubyn Trevor-Battye; Francis Edward Vincent; William Slade Vincent; Arthur James Vogan; Lieut.-Colonel R. A. Wahab, R.E.; Major William Lewis White, R.A.; Ramon O. Williams; James M. Wilson; John Wilson; Thomas Hugh Davidson Wood; Major John Alfred Wyllie, Indian Staff Corps.

The Paper read was:—

"Two Years in Uganda, Unyoro, and the Upper Nile Region." By Lieut. Seymour Vandeleur, D.S.O., Scots Guards.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria-Hungary—Agram. *M.K. u. K. Militär-G.I.* 15, 1895 (1896): 47–118. **Lehrl.**

Untersuchungen über etwaige in Verbindung mit dem Erdbeben von Agram, am 9 November 1880, eingetretene Niveauveränderungen. Von Franz Lehrl.

On the changes of level accompanying the Agram earthquake of November 9, 1880.

Austria-Hungary—Agram. *M.K. u. K. Militär-G.I.* 15, 1895 (1896): 119–202. **Weixler.**

Untersuchungen über die Wirkungen des Erdbebens vom 9 November 1880, auf die in und zunächst Agram gelegenen trigonometrischen Punkte. Bearbeitet von A. Weixler. *With Maps.*

A further study of the disturbances produced by the Agram earthquake.

Balkan Peninsula—Albania. **Glück.**

Jahresb. G. Ges. München, 1894 u. 1895 (1896): 175–222.

Reisen in Albanien. Von Oberauditeur Ludwig Glück.

Belgium. **Cornet.**

A propos du récent tremblement de terre de la Belgique et du nord de la France. Par J. Cornet. Extrait du *Mouvement Géographique*, Nos. 38 et 39 de 1896. Bruxelles, P. Weissenbruch, 1896. Size 10 × 6½, pp. 16. *Illustrations. Presented by the Author.*

Denmark—Old village plans. *Aarbog. Nordisk. Oldk. Historie* (*II.*) **11** (1896): 97–170. **Lauridsen.**

Om gamle danske Landsbyformer. Et Omrids af P. Lauridsen. *With Plans.*

France—Aquitane. *Sitzb. A.W. Berlin* (1896): 429–456. **Hirschfeld.**

Aquitanien in der Römerzeit. Von Otto Hirschfeld.

France—Mont Blanc. *C.Rd.* **123** (1896): 585–587. **Janssen.**

Sur les travaux exécutes en 1896 à l'observatoire du mont Blanc. Note de M. J. Janssen.

France—Pyrenees. **Piette.**

Hiatus et Lacune. Vestiges de la période de transition dans la grotte du Mas-d'Azil. Par Ed. Piette. (Extrait des Bulletins de la Société d'Anthropologie de Paris. Séance du 18 avril 1895.) Beaugency, 1895. Size 9 × 6, pp. 44. *Presented by the Author.*

Germany. *Deutsche Rundschau G.* **18** (1896): 353–356. **Hofmann.**

Die Marschbewohner an der Weser und Elbe. Von Alfred Hofmann.

Germany. **Richter.**

Bibliotheca Geographica Germaniae-Litteratur der Landes- und Volkskunde des Deutschen Reichs bearbeitet im Auftrage der Zentral-Kommission für wissenschaftliche Landeskunde von Deutschland durch Paul Emil Richter. Leipzig: W. Engelmann, 1896. Size 9 × 6, pp. x. and 842. *Presented by the Publisher.*

This is specially noticed in the Monthly Record.

Germany—Bavaria. *Jahresb. G. Ges. München*, 1894 *u.* 1895 (1896): 289–309. **Gruber.**

Die in den Jahren 1894 und 1895 zur Landeskunde Bayerns erschienene wichtigere Literatur. Von Dr. Christian Gruber.

A bibliography of recent Bavarian geography.

Germany—Plant distribution. *Naturw. Wochenschrift* **11** (1896): 449–450. **Conwentz.**

Neue Beobachtungen über urwüchsige Eiben im nordöstlichen Deutschland. Von H. Conwentz.

Germany—Prussia. *Globus* **70** (1896): 261–265. **Krause.**

Gräberfeld bei Vitzke in der Altmark. (La Tène und Spätrömisch). Von Konservator Eduard Krause. *With Illustrations.*

Germany—Rivers. *Jahresb. G. Ges. München*, 1894 *u.* 1895 (1896): 1–50. **Zimmerer.**

Hans Sachs und sein Gedicht von den 110 Flüssen des deutschen Landes (1559) mit einer zeitgenössischen Landkarte herausgegeben und erläutert von Dr. Heinrich Zimmerer.

An account of the German Drayton, whose forerunner of the "Polyolbion" is here quoted and annotated.

Germany—The Saale. **Ule.**

Zur Hydrographie der Saale. Von Dr. Willi Ule. Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Zehnter Band. Heft 1. Stuttgart: J. Engelhorn, 1896. Size 9½ × 6½, pp. 56. *Map.*

Dr. Ule describes the limits of the basin of the Saale with a map on the scale of 1:500,000 of all the ramifications of the river system, treats of the orographical and geological conditions, and finally in great detail of the rainfall and flow of water in the stream.

Germany—Thuringia. **Regel.**

Thüringen. Ein geographisches Handbuch. Von Dr. Fritz Regel. Erster Teil: Das Land. Zweiter Teil: Biogeographie; Erstes Buch, Pflanzen- und Tierverbreitung; Zweites Buch, Die Bewohner. Dritter Teil: Kulturgeographie. Jena: G. Fischer, 1892–1896. Size 10½ × 7, pp. (Erster Teil) xvi. and 400; (Zweiter Teil) vi. and 840; (Dritter Teil) xvi. and 490. *Map and Illustrations. Price* 33*s.*

This important work will be specially noticed. It is a specimen of the thorough geographical study of a region of considerable topographical variety and great historical interest.

Holland. *Blackwood's Mag.* **160** (1896): 626–642. ——

Behind Dikes and Dunes.

A bright record of a tour in Holland.

Hungary. **Browning.**

A Girl's Wanderings in Hungary. By H. Ellen Browning. London: Longmans & Co., 1896. Size 8 × 5½, pp. xiv. and 332. *Map and Illustrations. Price 7s. 6d. Presented by the Publishers.*

A book of a class now familiar, mingling clever observations of land and people with scraps of gossip of no special interest or value.

Hungary. *Abrégé B.S. Hongroise G.* **24** (1896): 16–20. **György.**

Les Bohémiens en Hongrie. Par Aladár György.

Hungary—Budapest. *Abrégé B.S. Hongroise G.* **24** (1896): 9–15. **Berecz.**

Population de la ville de Budapest. Par Antoine Berecz.

Hungary—Lakes. *Abrégé B.S. Hongroise, G.* **24** (1896): 1–9. **Hanusz.**

Die stehenden Wasser unseres Landes von Stefan Hanusz.

Italy. *L'Universo* **6** (1895): 212–214. **Giordani.**

Geografia di Casa nostra: Il Turturone o Castagna primo affluente di sinistra dell' Assinaro del prof. Pasqualino Carlo Giordani.

Italy. *Riv. G. Italiana* **3** (1896): 65–74, 177–187. **Grasso.**

Gli "Strapellini" di Plinio, del prof. Gabriele Grasso.

A discussion as to the situation of the town Strapellini mentioned by Pliny.

Italy—Rome. **Kiepert and Hvelsen.**

Formæ vrbis Romæ Antiqvæ. Delineavervnt H. Kiepert et Ch. Hvelsen. Accedit Nomenclator Topographicvs A. Ch. Hvelsen compositvs. Berolini: D. Reimer, 1896. Size 11½ × 8, pp. xii. and 110. *Plans. Price* 12 *mark. Presented by the Publisher.*

This consists of a map in three sheets of ancient Rome printed in black over a map of modern Rome in pale red. A topographical index, with copious references to classical writers, and a preface in Latin, form the letterpress. The work should prove of the utmost service to the student.

Italy—Sardinia. *Jahresb. G. Ges. München*, 1894 *u.* 1895 (1896): 68–87. **Knoll.**

Eine Reise durch Sardinien. Von Dr. Ernst Knoll.

Italy—Venetian lagoons. *Riv. G. Italiana* **3** (1896): 200–211. **Marinelli.**

Intorno alla origine della profonda cavità esistente nel porto di Malamocco. Osservazioni di Olinto Marinelli.

Mediterranean. **Cavan.**

With the Yacht and Camera in Eastern Waters. By the Earl of Cavan, K.P. London: Low & Co., 1897 (1896): Size 8 × 5½, pp. xvi. and 28. *Map and Illustrations. Price* 12*s.* 6*d. Presented by the Publishers.*

A continuation of Lord Cavan's practical yachtsman's guide to the Mediterranean, worthy of all the praise bestowed on the previous volume. The harbours described and photographed are those in the north-east of the Mediterranean, including the Greek Archipelago and the coast of Asia Minor. The photographs are from well-chosen standpoints; but we regret to find that the unscientific plan of printing in clouds which did not form part of the original picture is still adopted. In one illustration a grotesque effect of distorted perspective is given by fleecy clouds floating across the sail of a boat as if it were a snowy mountain summit.

Portugal—Lisbon **Pereira.**

Miscellanea historica. No. 1. A inscripção lapidar na Rua do Salvador (Monographia). Por J. M. Esteves Pereira. Lisboa: Empreza do "Occidente," 1896. Size 6½ × 4½, pp. 16.

The inscription referred to speaks of the arrangement of the streets of Lisbon before the great earthquake.

Russia—Caucasus. *Aus allen Weltteilen* **27** (1896): 467–472. **Benndorf.**

Durch den Kaukasus. Von Paul Benndorf.

Russia—Caucasus. *Scottish G. Mag.* **12** (1896): 458–470. **Dingelstedt.**

The igneous rocks of the Caucasus. By V. Dingelstedt.

Russia—Finland. **Berghell.**

Bidrog till Rännedomen om Södra Finlands Rvartära nivåförändringar. Akademisk afhandling af Hug Berghell. Helsingfors, 1896. Size 10 × 7, pp. 60. *Map and Illustrations.*

On quaternary changes of level in southern Finland.

Russia—Moscow. *Deutsche Rundschau G.* **18** (1896): 342–350. **Müller-Bohn.**
Ein Besuch im Kloster Tróitzky bei Moskau. Von Hermann Müller-Bohn. *With Illustration.*

Russia—Novaya Zemlya. *Ymer* **16** (1896): 129–149. **Tschernyschew.**
Den ryska expeditionen till Novaja Semlja 1895. Af Th. Tschernyschew. *With Map.*

Russia—Novaya Zemlya. *Aus allen Weltteilen* **27** (1896): 457–466. **Nossiloff.**
Ein winterlicher Schneesturm auf Nowaja Semlja. Auszug aus einem Briefe von R. Nossiloff.

United Kingdom—England—Yorkshire. **Fox-Strangways.**
P. Yorkshire Geolog. and Polytechnic S. (*n.s.*) **13** (1895): 15–20.
Glacial Phenomena near York. By C. Fox-Strangways. *With Map.*

United Kingdom—England—Yorkshire. **Tate.**
P. Yorkshire Geolog. and Polytechnic S. (*n.s.*) **13** (1895): 58–63.
The Malham Dry River Bed. By Thomas Tate. *With Map and Plates.*

United Kingdom—Scotland. *Scottish G. Mag.* **12** (1896): 513–522. **Mackay.**
Sutherland Place-Names. By John Mackay.

ASIA.

Armenia and Persia. **Harris.**
From Batum to Baghdad viâ Tiflis, Tabriz, and Persian Kurdistan. By Walter B. Harris. Edinburgh and London: W. Blackwood & Sons, 1896. Size 8½ × 6, pp. xii. and 336. *Map and Illustrations. Price* 12*s. Presented by the Publishers.*

Mr. Harris, who is well known from his travels in Morocco and Arabia, travelled in 1895 from Batum to Baghdad, passing Tiflis, Lake Gokcha, Erivan, Tabriz, Lake Urumia, and southward through Persian Kurdistan to Kermanshah, turning then westward to Baghdad. Mr. Harris gives the narrative of his journey in a lively manner, wisely avoids the vexed political questions of which the scene of his travels is the centre, and illustrates the country passed through by means of some good sketches and excellent photographs.

Asia—Russian Colonization. *B.S.G. Lyon* **14** (1896): 35–41. **Blanc.**
La colonisation russe en Asie. Par Edouard Blanc.

Asia-Minor. *J.R. Asiatic S.* (1896): 733–741. **Le Strange.**
Al-Abrīk, Tephrikē, the capital of the Paulicians; a correction corrected. By Guy le Strange.

British Borneo. **Roth.**
The Natives of Sarawak and British North Borneo, based chiefly on the MSS. of the late Hugh Brooke Low, Sarawak Government Service. By Henry Ling Roth. With a Preface by Andrew Lang. 2 vols. London: Truslove & Hanson, 1896. Size 10½ × 7, pp. (vol. i.) xxxii. and 464: (vol. ii.) iv., 302, and ccxl. *Map and Illustrations. Price* 50*s.*

Mr. Ling Roth's important book has been already referred to in the Monthly Record, where attention was called to his definition of the name Dayak. The plan of these volumes is to give the fullest account of the habitat, physique, manners, customs, beliefs, and possessions of the Bornean natives, almost always in the language of the authorities responsible for the observations. The advantage of the plan is that it allows the reader to compare the various descriptions directly; the disadvantage is that the special knowledge of the compiler is not brought forward so prominently as it deserves to be.

Central Asia. *Deutsche Rundschau G.* **19** (1896): 10–18. **Stenin.**
Ein Blatt aus der Geschichte Mittel-Asiens. Von Peter v. Stenin. *With Illustrations.*

Central Asia—Lob Nor. *Petermanns M.* **42** (1896): 201–205. **Hedin.**
Ein Versuch zur Darstellung der Wanderung des Lop-nor-Beckens in neuerer Zeit. Von Dr. Sven Hedin. *With Map.*

Ceylon. **Cave.**
The Ruined Cities of Ceylon. By Henry W. Cave. A Paper read before the British Association for the Advancement of Science, at the Liverpool Meeting in September, 1896. Oxford: Upstone and Son. Size 8½ × 6, pp. 28. *Presented by the Author.*

China and Korea. *Petermanns M.* **42** (1896): 205–209. **Supan**

Regentafeln von China and Korea. Von A. Supan. *With Map.*

China—Hainan. **Hirth.**

Friedrich Hirth. Die Insel Hainan nach Chao Ju-kua (Sonder-Abdruck aus der Bastian-Festschrift). Berlin: D. Reimer, 1896. Size 11 × 7¼, pp. 30.

Chinese Art. **Hirth.**

Ueber fremde Einflüsse in der chinesischen Kunst. Von Friedrich Hirth. München und Leipzig: G. Hirth, 1896. Size 9 × 6, pp. xviii. and 84. *Illustrations. Presented by the Publisher.*

This memoir finds evidence in old Chinese ornamental mirrors and other artistic work of the influence of Greek art, coming through Bactria, in the first century B.C., and also of Buddhist art from India. A number of the designs on which these views were founded are reproduced.

Egypto-Assyrian Railway. *J.S. Arts* **44** (1896): 793–796. **Fraser.**

The Egypto-Assyrian Railway as the New Overland Route to India. By Colonel A. T. Fraser. *With Map.*

The proposed railway would run from Alexandria to the head of the Gulf of Akaba, thence across Northern Arabia to Basra, along the east side of the Persian Gulf, and following the coast of Baluchistan to Karachi.

Formosa. **Campbell.**

Past and Future of Formosa, with a new Map of the Island. By Rev. W. Campbell. (Reprinted from the *Scottish Geographical Magazine* for August, 1896.) Size 10 × 6½, pp. 16. *Presented by the Author.*

India—Burma. **Carey and Tuck.**

The Chin Hills: a History of the People, our Dealings with them, their Customs and Manners, and a Gazetteer of their Country. By Bertram S. Carey and H. N. Tuck. Volume i. Rangoon, 1896. Size 10½ × 7½, pp. vi. and 236. *Photographs. Presented by the Chief Commissioner, Burma.*

This will be specially noticed.

India—Burma—Census.

Government of India. Census of 1891. Provincial Tables. Burma Report. Volume iii., containing District, Township, Circle, and Village tables of Lower Burma (pp. xii. and 684); volume iv., containing District, Township, Circle, and Village tables of Upper Burma (pp. xviii. and 702). Rangoon, 1892–93. Size 13½ × 8½.

India—Chitral. *J.R. United Service I.* **40** (1896): 1235–1267. **Hamilton.**

The 2nd Brigade in the Chitral Relief Expedition, 1895. By Major W. H. Hamilton. *With Maps.*

India—Sikhim. *B.S.G. Commerc. Bordeaux* **19** (1896): 486–497. **Jambon.**

Le Sikkim. Par Ch. Jambon. *With Map.*

An account of Sikhim based on a journey in 1893 in company with Mr. J. Louis, and already described by him in his important book 'The Gates of Tibet.'

India—Sikhim. **Paul.**

The Himalayan State of Sikhim. By Hon. A. W. Paul. Report of the Sixth Meeting of the Australasian Association for the Advancement of Science, held at Brisbane, Queensland, January, 1895. Sydney. Size 9 × 6, pp. 552–557. *Diagrams.*

India—Transport. *J. United Service I. India* **25** (1896): 1–54. **Bingley and Moberly.**

The Improvement of the Present Organization of Transport in India. Prize Essay. By Captain A. H. Bingley.

Ditto. By Captain F. J. Moberly. *With Illustrations.*

Indo-China. *J. Asiatique* (9) **8** (1896): 129–154. **Lefèvre-Pontalis.**

Notes sur quelques populations du nord de l'Indo-Chine. (2e série.) Par M. Pierre Lefèvre-Pontalis.

Japan. *National G. Mag.* **7** (1896): 285–289. **Scidmore.**

The recent Earthquake Wave on the Coast of Japan. By Eliza Ruhamah Scidmore. *With Map and Illustrations.*

Korea. **Gardner.**

Corea. By Christopher Thomas Gardner, C.M.G., etc. Report of the Sixth Meeting of the Australasian Association for the Advancement of Science, held at

Brisbane, Queensland, January, 1895. Sydney. Size 9 × 6, pp. 483–532. *Maps, Plans, and Illustrations.*

Mr. Gardner speaks of tobacco as a future export of great value from Korea.

Korea. *Rendiconti R.A. Lincei* (5) **5** (1896): 111–138. **Nocentini.**

Materiali per la geografia della Corea. Nota del Prof. L. Nocentini.

Macao. *B.S.G. Lisboa* **15a** ser. No. 1, 1896: 3–44. **Loureiro.**

Macau e o seu Porto. Conferencia feita na Sociedade de Geographia na Sessão de 4 de Novembro de 1895. Por Adolpho Loureiro.

Malay Archipelago—Moluccas and Borneo. **Kukenthal.**

Rev. Scientifique (4) **6** (1896): 365–367.

Exploration zoologique aux îles Moluques et à Bornéo, d'après M. Kukenthal.

Persia. *Petermanns M., Ergänzungsheft* **118** (1896): 40. **Stahl.**

Reisen in Nord- und Zentral-Persien. Von A. F. Stahl. *With* **3** *Maps.*

This will receive special notice.

Siberia. *Rev. Française* **21** (1896): 605–609. ——

La colonisation de la Sibérie.

Siberia. *Aus allen Welttheilen* **27** (1896): 433–448. **Kern.**

Die neueste topographische Erforschung Sibiriens. Nach den Veröffentlichungen der "Russischen Geographischen Gesellschaft." Von H. Kern.

Siberia—Antiquities. *Ymer* **16** (1896): 151–179. **Johansson.**

Om de fornturkiska inskrifterna från Orkhon och Jenissei samt prof. Vilh. Thomsens dechiffrering och tolkning däraf. Af Karl Ferdinand Johansson.

Siberia—Coal. *C. Rd.* **123** (1896): 518–520. **Venukoff.**

Sur les résultats des recherches du charbon minéral, récemment faites en Sibérie. Note de M. le général Venukoff.

The mineral and other resources of the country through which the great Siberian railway passes, are being investigated by a number of scientific commissions, the results of the investigation of the coal-supply being given here.

Southern and Western Asia. **Keane.**

Stanford's Compendium of Geography and Travel (New Issue). Asia. Vol. ii. Southern and Western Asia. By A. H. Keane. London: E. Stanford, 1896. Size 8 × 5½, pp. xxiv. and 526. *Maps and Illustrations. Price* 15*s. Presented by the Publisher.*

This volume is accompanied by an excellent preface calling attention to the immense advances which have been made in our knowledge of Asia during the last fourteen years—advances which this volume may very probably be the means of making known to the general public for the first time. The compilation is characterized by the minute care which Mr. Keane always bestows on his work. It is apt, however, to perpetuate the popular belief that Burma is less a part of the Indian empire than any of the other provinces, to describe it in a separate chapter.

Syria—Palestine. *Q. Statement, Palestine Exploration Fund* (1896): 346–349. **Bain.**

An Armenian Description of the Holy Places in the Seventh Century. Translated from the Russian by R. N. Bain.

Syria—Palestine—Kerak. **Dowling.**

Q. Statement, Palestine Exploration Fund (1896): 327–332.

Kerak in 1896. By Rev. Theodore E. Dowling.

A short but interesting account of Kerak, on the east side of the Dead Sea, within sight of Jerusalem, but, until the appointment of the present Turkish governor, practically inaccessible to tourists. The elevation has been fixed as 700 feet above Jerusalem, or 3400 feet above the Mediterranean. The surrounding country is being replanted with vines and other fruit trees by the Government.

Western Asia. *Rev. Scientifique* (4) **6** (1896): 449–454. **Bontroue.**

La langue française dans le Levant. Par M. A. Bontroue.

AFRICA.

Algeria. *Deutsche Rundschau G.* **18** (1896): 337–342. **Grothe-Harkanyi.**

Friedhöfe und Todtengebräuche der Eingeborenen Algeriens. Von Dr. Hugo Grothe-Harkanyi. *With Illustrations.*

British East Africa—Uganda. **Baskerville.**

Buganda. By Rev. Geo. K. Baskerville.—Report of the Sixth Meeting of the Australasian Association for the Advancement of Science, held at Brisbane, Queensland, January, 1895. Sydney. Size 9 × 6, pp. 557–561.

Mainly from the missionary standpoint.

British East Africa. **Craufurd.**

Geographical Report by Clifford H. Craufurd to the Marquess of Salisbury, on the Jubaland Province. 1896. Size 13½ × 8½, pp. 10. *Map. Presented by the Foreign Office.*

British West Africa—Ashanti. *Scottish G. Mag.* **12** (1896); 441–458. **Barter.**

Notes on Ashanti. By Major C. Barter.

Congo State. *Mouvement G.* **13** (1896): 493–495. **Wauters.**

Le Congo en amont des Falls et le Lomami. [Par A. J. Wauters.] *With Map and Illustration.*

Domestication of Elephant. **Bourdarie.**

B.S.G. Comm. Bordeaux **19** (1896): 472–479.

Notice sommaire sur la domestication de l'éléphant d'Afrique. Par Paul Bourdarie.

Egyptian Antiquities. **Budge.**

Some Account of the Collection of Egyptian Antiquities in the possession of Lady Meux, of Theobald's Park, Waltham Cross. By E. A. Wallis Budge. Second Edition. With thirty-four Plates. London: Harrison & Sons, 1896. Size 12 × 9½, pp. xii. and 362. *Presented by Lady Meux.*

This beautifully printed volume gives a list and many figures of Lady Meux's valuable collection of Egyptian antiquities, and is introduced by an account of an ancient Egyptian funeral by Dr. Wallis Budge.

German East Africa. *Aus allen Welttheilen* **27** (1896): 389–398. **Woas.**

Die Deutsch-Ostafrikanische Centralbahn. Von Franz Woas.

German South-West Africa. *Aus allen Welttheilen* **27** (1896): 397–410. **Dove.**

Die Landschaft um Windhoek. Von Privatdozent Dr. Karl Dove. *With Illustrations.*

Morocco. *B.S.G. Barcelona* **1** (1896): 29–34. **Romen.**

Nuestro comercio en Marruecos. Por D. José Boadu y Romen.

On Spanish trade with Morocco.

North Africa. *B. L'Union Coloniale Française* **2** (1896): 95–96. ——

L'élevage de l'autruche dans l'Afrique du Nord.

Portuguese East Africa. *B.S.G. Lisboa* **15** (1896): 45–96. **Noronha.**

Lourenço Marques e as suas relações com a Africa do Sul. Conferencias feitas na Sociedade de Geographia nas sessões de 2 de dezembro de 1895 e 13 de janeiro de 1896. Por Eduardo de Noronha.

Transvaal. **Timmerman.**

Eenige opgaven betreffende de Zuid-Afrikaansche Republiek. Door J. Æ. C. A. Timmerman.—Overgedrukt uit het Tijdschrift van het Kon. Nederlandsch Aardrijkskundig Genootschap. Leiden: E. J. Brill, 1896. Size 9½ × 6½, pp. 150–162, 264–279. *Presented by the Author.*

Tunis—Roman remains. **Gauckler.**

A travers le Monde, Tour du Monde (*n.s.*) **2** (1896): 329–332.

La Mosaïque romaine en Afrique. Par M. Gauckler. *With Illustrations.*

West Africa—Bissagos Archipelago. **Astrie.**

A Voyage to Kagnabak Island, Bissagos Archipelago. By Max Astrie. [Translated by A. J. Boyd.] Report of the Sixth Meeting of the Australasian Association for the Advancement of Science, held at Brisbane, Queensland, January, 1895. Sydney. Size 9 × 6, pp. 579–587.

NORTH AMERICA.

British Columbia and Alaska. **Pike.**

Through the Subarctic Forest. A Record of a Canoe Journey from Fort Wrangel to the Pelly Lakes and down the Yukon River to the Behring Sea. By Warburton Pike. London: E. Arnold, 1896. Size 9 × 6, pp. xvi. and 296. *Maps and Illustrations. Price* 16*s. Presented by the Publisher.*

Mr. Warburton Pike writes with the same modesty regarding his scientific merits and the same enthusiasm for sport and adventurous travel which characterized his earlier book on the Barren Grounds. The route of the journey now described lay up the Dease river from its mouth opposite Prince of Wales island, and then down the Pelly and Yukon rivers. A special note will be given in the Monthly Record on the geographical results. The want of an index may be noted—a want more noticeable on account of the racy originality of Mr. Pike's index to his 'Barren Grounds.'

Canada. *Nautical Mag.* **65** (1896); 896–905. **Colmer.**

The New North-West Passage. By J. G. Colmer, C.M.G. *With Illustration.*

On the composite land and sea route to Eastern Asia across Canada.

United States—Census. ———

Abstract of the Eleventh Census: 1890. Second Edition. Washington, 1896. Size 9½ × 6, pp. x. and 300.

United States—Geographic Positions. **Gannett.**

A Dictionary of Geographic Positions in the United States. Compiled by Henry Gannett. Bulletin of the United States Geological Survey. No. 123. Washington, 1895. Size 9 × 6, pp. 184. *Presented by the U.S. Geological Survey.*

This will be specially noticed.

United States—Great Plains. **Hay.**

Water Resources of a Portion of the Great Plains. By Robert Hay.—Sixteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1894–95. Part ii. Pp. 541–588. Washington, 1895. Size 12 × 8. *Maps, Sections, and Illustrations.*

The district considered in the report is a strip extending south from the North Platte river, a little north of 41° to 38° 30′ N. along the meridian of 102° W., an area of over 5000 square miles, embracing parts of the states of Kansas, Nebraska, and Colorado in the upper basin of the Kansas river, with an average elevation of about 4000 feet.

United States—Hydrography. **Newell.**

Report of Progress of the Division of Hydrography for the Calendar Years 1893 and 1894. By Frederick Haynes Newell.—Bulletin of the United States Geological Survey. No. 131. Washington, 1895. Size 9 × 6, pp. 126. *Presented by the United States Geological Survey.*

United States—Missouri. **Winslow.**

The Disseminated Lead Ores of South-eastern Missouri. By Arthur Winslow. Bulletin of the United States Geological Survey. No. 132. Washington, 1896. Size 9½ × 6, pp. 32. *Maps and Sections. Presented by the U.S. Geological Survey.*

United States—Montana. **Weed and Pirsson.**

American J. Science (4) **2** (1896): 188–199.

The Bearpaw Mountains of Montana. Second Paper (Part ii.). By Walter Harvey Weed and Louis V. Pirsson. *With Illustrations.*

United States—New York. **Silvercruys.**

B. Union G. Nord de la France **16** (1895): 289–352.

New-York, ses faubourgs et ses habitants. Par Edouard Silvercruys.

United States—Pennsylvania. **Walcott.**

The Cambrian Rocks of Pennsylvania. By Charles Doolittle Walcott.—Bulletin of the United States Geological Survey. No. 134. Washington, 1896. Size 9½ × 6, pp. 44. *Map and Plates. Presented by the U.S. Geological Survey.*

United States—Public Lands. **Newell.**

The Public Lands and their Water Supply. By Frederick H. Newell.—Sixteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1894–95. Part ii. Pp. 463–533. Washington, 1895. Size 12 × 8. *Maps and Illustrations.*

A map of the United States shows by appropriate colours the area of vacant public

lands, Indian lands, forest reservations, and lands disposed of, indicating by special shading the "wagon and railroad grants," and the lands never owned by the national government.

United States—Rhode Island. **Davis.**

The State Map of Rhode Island as an aid to the study of Geography in Grammar and High Schools. By William Morris Davis. 1896. Size 9½ × 6, pp. 16.

United States—Rhode Island. *J. Geology* 4 (1896): 691–703. **Woodworth and Marbut.**

The Queen's River Moraine in Rhode Island. By J. B. Woodworth and C. F. Marbut. *With Illustrations.*

United States—Roads. **Shaler.**

Preliminary Report on the Geology of the Common Roads of the United States. By Nathaniel Southgate Shaler.—Fifteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1893–94. By J. W. Powell, Director. Pp. 259–306. Washington, 1895. Size 12 × 8.

United States—Weather Service. *National G. Mag.* 7 (1896): 302–307. **Moore.**

The Weather Bureau River and Flood System. By Prof. Willis L. Moore.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

Austro-Hungary. **Liebenow.**

Verkehrs-Karte von Oesterreich-Ungarn nebst den angrenzenden Ländern des deutschen Reiches von Russland und der Europäischen Türkei Bearbeitet von W. Liebenow, Geheimer Regierungs-Rath. Scale 1 : 1,250,000 or 19·7 stat. miles to an inch. Stich, Druck und Verlag des Berliner Lithogr. Instituts. Berlin, 1896.

England. **Bartholomew.**

Bartholomew's Reduced Ordnance Survey of England and Wales :—North Devon, scale 1 : 126,720 or 2 stat. miles to an inch, by John Bartholomew, F.R.G.S. W. H. Smith & Son, London. *Price 2s. mounted on cloth. Presented by Messrs. J. Bartholomew & Co.*

England and Wales. **Ordnance Survey.**

Publications issued since October 7, 1896.

1-inch—General Maps :—

ENGLAND AND WALES :—240, 283, 302, 303, 348, 353, 358, hills engraved in black or brown, *revised;* 276, 340, 350, hills engraved in black or brown; 203, 272, 351, engraved in outline, 1*s.* each.

6-inch—County Maps :—

ENGLAND AND WALES :—**Cornwall** (revision), 38 N.W., S.W., 1*s.* each. **Devonshire** (revision), 117 S.W., 123 N.W., N.E., S.E., 124 N.W., N.E., S.W., S.E., 130 S.E., 1*s.* each. **Hampshire** (revision), 2 S.W., S E., 1*s.* each. **Lancashire** (revision), 103 S.E., 110 N.W., 115 S.E., 116 N.E., showing Manchester Ship Canal, 1*s.* each. **Yorkshire** (revision), 184 S.E., 1*s.*; 63, 95, 164 W., 2*s.* each; 48, 80, 81, 82, 83, 96, 97, 99, 114, 117, 118, 135, 136, 148, 151, 2*s.* 6*d.* each.

25-inch—Parish Maps :—

ENGLAND AND WALES :—**Durham** (revision), X. 14; XVI. 7; XVII. 5, 6, 8; XVIII. 13; XIX. 5, 12, 13, 16; XX. 9, 11, 12, 13; XXI. 5, 7, 10, 11, 12; XXIV. 4; XXV. 1; XXVI. 2, 3, 3*s.* each. **Essex** (revision), XLIX. 7; LI. 15; LX. 10; LXVIII. 5, 6, 7, 9, 11; LXX. 5, 3*s.* each. **Hampshire** (revision), XXXV. 10, 16; XXXVI. 2, 5, 6; XLI. 16; XLI. 7, 8, 9, 12; XLII. 3, 5, 6, 7, 9, 10, 13, 14, 16; XLIII. 4, 6, 8, 9, 14, 15; XLVIII. 2, 3, 4; XLIX. 11; L. 5, 6; LI. 10, 3*s.* each. **Hertfordshire** (revision), XLV. 2, 15, 3*s.* each. **Kent** (revision), XVI. 8; XXIX. 7, 11, 12, 16; XL. 3, 9, 10, 3*s.* each. **Middlesex** (revision), VI. 2, 15; IX. 3, 7, 11, 15, 16; XI. 2, 6, 9, 13; XV. 1. 3, 4, 7, 10, 14; XVI. 1; XX. 2, 7, 3*s.* each. **Northumberland** (revision), LXXXII. 10, 11, 14, 15; LXXXIV. 8, 13; LXXXV. 1, 16; XCI. 1, 2, 3, 8, 10, 14, 16; XCIII. 3, 4, 8; C. 2, 3, 4, 7, 11, 12, 15, 16; CI. 8, 11, 13, 14, 15, 16; CII. 1, 3 6, 7, 9, 13, 16; CIII. 1, 4; CVI. 1, 2, 3, 5, 9, 10, 12; CVIA. 3, 4, 7, 8, 12, 16; CVIB. 4; CVIII. 1, 2, 5, 3*s.* each. **Surrey** (revision),

XVI. 9; XX. 11, 16; XXIII. 13; XXVI. 4, 8, 9, 12; XXVII. 1, 4, 5, 6, 7, 8, 9, 10, 12, 16; XXVIII. 1; XXXI. 2, 3, 6, 7; XXXII. 4, 5, 10, 11, 12; XXXIII. 9, 10, 11, 3*s.* each.

(*E. Stanford, Agent.*)

Europe. **Poole.**

Historical Atlas of Modern Europe from the Decline of the Roman Empire. Comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., PH.D. Lecturer in Diplomatic in the University of Oxford. Oxford: at the Clarendon Press; London, Edinburgh, and Glasgow: Henry Frowde; Edinburgh: W. & A. K. Johnston, 1896. Part I. *Price* 3*s.* 6*d.* *Presented by the Clarendon Press.*

In this atlas it is intended to follow the same system as that adopted in Spruner and Menke's well-known historical atlas. The work of editing has been entrusted to Mr. Reginald Poole, M.A., PH.D., and the services of persons of recognized authority have been engaged to write the explanatory letterpress. When complete the atlas will contain about ninety maps, which will be issued in thirty monthly parts. This is the first issue, and contains the following maps: Map 2, Europe from 395 to 527 A.D., by Professor J. B. Bury; Map. 15, Roman Britain, by F. Haverfield; Map 44, The Swiss Confederation, by Rev. W. A. B. Coolidge.

Ireland. **Bartholomew.**

Bartholomew's Reduced Ordnance Survey of Ireland. Cork and Killarney District. Scale 1: 253,440 or 4 stat. miles to an inch. J. Bartholomew & Co., Edinburgh. *Price* 2*s.*, *mounted on cloth.* *Presented by Messrs. J. Bartholomew & Co.*

Italy. **Instituto Geografico Militare, Firenze.**

Carta d'Italia. Scale 1: 100,000 or 1·5 miles to an inch: F° 50, Padova; 52, S'Dona di Piave; 53, Foce del Tagliamento; 63, Legnago; 64, Rovigo; 65, Adria; 75, Mirandola; 76, Ferrara; 77, Comacchio; 89, Ravenna; 121, Montepulciano; 137, Viterbo; 138, Terni. Instituto geografico militare, Firenze. *Price* 1 *li* 50 *centimes each sheet.*

Norway. **Cammermeyer.**

Cammermeyers Kart over Det Sydlige Norge med Oversigtskart over det nordlige Norge, i 2 Blade, udarbeidet efter officielle Karter og Opgaver ved Per Nissen. Scale 1: 800,000 or 12·6 stat. miles to an inch. Alb. Cammermeyers Forlag (Lars Swanstrom). Kristiania, 1895.

This map is well suited for the use of tourists. It is orographically coloured, showing contours of 500 metres apart from 500 to 2500 metres. All means of communication are laid down, and tables showing the distances of places from Christiania and Trondhjem are given, as well as an explanation of the symbols employed to denote the character of the roads and the comparative importance of places.

Roumania. **Michăilescu.**

România Harta-Murală executată in Stabilimentul grafic. J. V. Socecŭ si intocmită pentru usul scólelor de Nicolae Michăilescu professor. Scale 1: 428,000 or 6·7 stat. miles to an inch. Editura librariei Socecŭ & Comp. Bucuresti.

This is a good wall-map of Roumania, and gives a large amount of general information about the country, which will be useful to students.

Scotland. **Bartholomew.**

Bartholomew's Reduced Ordnance Survey of Scotland. Sheet 2, Dumfries and Solway. Scale 1: 126,720 or 2 stat. miles to an inch. J. Bartholomew & Co., Edinburgh. *Price* 2*s.*, *mounted on cloth.* *Presented by Messrs. J. Bartholomew & Co.*

Switzerland. **Schmid, Francke & Cie.**

Distanzenkarte des Berneroberlandes. Scale 1: 200,000 or 3·15 stat. miles to an inch. Verlag von Schmid, Francke & Cie. Bern, 1896.

The distances, in hours, between the principal places on this map are marked in figures, and the nature of the roads are also indicated. Other information with regard to the positions of hotels, etc., which will be useful to tourists, is also given.

AFRICA.

Africa. **Service Geographique de l'Armée.**

Carte de l'Afrique. Scale 1: 2,000,000 or 31·5 stat. miles to an inch. No. 11, In Salah; No. 12, Mourzouk; No. 16, St. Louis; No. 27, El Facher; No. 40,

Loulouabourg; No. 44, Kabébé. Service Geographique de l'Armée, Paris. *Price 1 franc each sheet.*

Africa. **Bacon & Co.**

The Excelsior Atlas of Africa, containing twenty-four maps and index to two thousand names. G. W. Bacon & Co., London. *Presented by Messrs. G. W. Bacon & Co. Price 1s.*

This little atlas is published at a price that will put it within the reach of all. It contains physical, ethnographical, and political maps.

East Africa. **Kolb.**

Originalkarte von Ukambani und dem Kenia-Gebiet. Nach eigenen Aufnahmen von 1894–1896 gezeichnet von Joh. George Kolb. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. Petermann's 'Geogr. Mitteilungen,' Jahrgang 1896, Tafel 17. Gotha: Justus Perthes, 1896. *Presented by the Publisher.*

AMERICA.

Brazil. **Rio-Branco.**

Estados Unidos do Brazil. Scale 1: 5,000,000 or 78·8 stat. miles to an inch. Mappa desenhado e gravado sob a direcção do Sñr. Barão de Rio-Branco. Guillard, Aillaud & C^ie^. Paris-Lisboa, 1894.

Though this professes to be a map of Brazil, it includes the whole of Bolivia, Paraguay, Uruguay, and parts of Peru and the Argentine Republic.

GENERAL.

General. **Saint-Martin.**

Atlas Universel de Géographie construit d'apres les sources originales et les documents les plus récents cartes, voyages, mémoires, travaux géodésiques, etc. Avec un teste analytique ouvrage commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader 84 cartes gravées sur cuivre sous la direction de MM. E. Collin et Delaune. No. 34, Europe Centrale, Feuille N.E. Librairie Hachette et Cie. Paris, 1896. *Price 2 francs.*

This issue contains the North-East sheet of a map of Central Europe. With the appearance of this map, 35 sheets of this atlas, which when finished will contain 84. maps, have been published.

CHARTS.

United States Charts. **U.S. Hydrographic Office.**

No. 1547, Lake Erie, Cleveland Harbor, and Cuyahoga R.; No. 1549, Mersina Roadstead, Mediterranean Sea. Pilot Charts of the North Atlantic and North Pacific Oceans, October, 1896 (with Graphical Solution of Spherical Triangles by Commander C. D. Sigsbee, U.S. Navy). U.S. Hydrographic Office, Washington, D.C. *Presented by U.S. Hydrographer.*

PHOTOGRAPHS.

Chitral. **Chitral Expedition.**

48 Photographs taken during the late Chitral Expedition by the Photographic Section of the Bengal Sappers. *Presented by Captain F. E. G. Skey, R.E.*

This is a very valuable set of photographs taken by the photographic section of the Bengal Sappers during the Chitral expedition. They are not only excellent specimens of photography, but give a more accurate idea of the country traversed by the expedition than could be conveyed by any verbal description.

Pamirs. **Gerard.**

46 Photographs of the Pamirs, taken by members of the Commission with General Gerard, 1895. *Presented by T. Hoffmann, Esq.*

This Society is indebted to Mr. Hoffmann for some of the most interesting photographs in its collection. The present donation consists of a series of photographs taken by members of the Commission with General Gerard in 1895.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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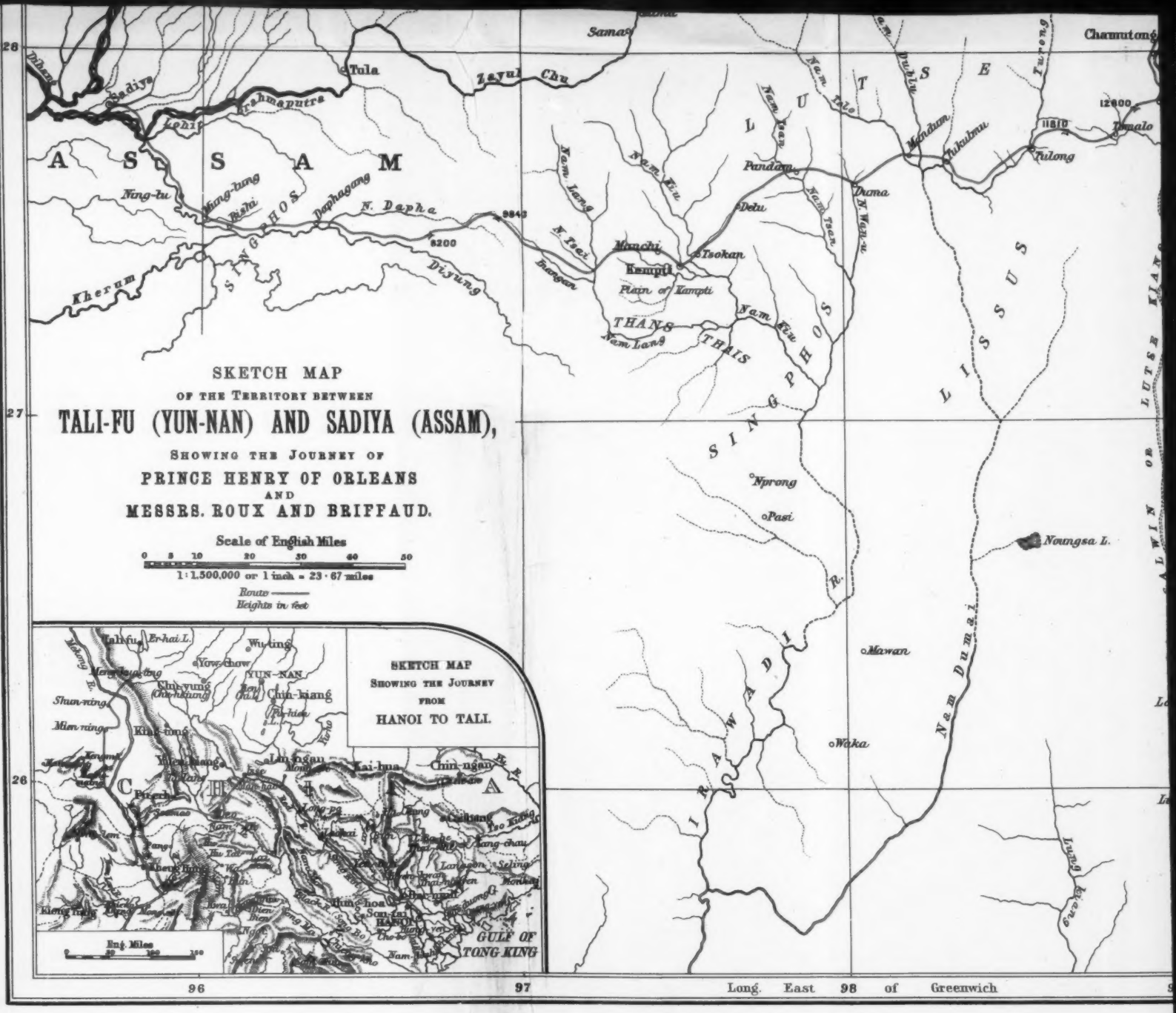

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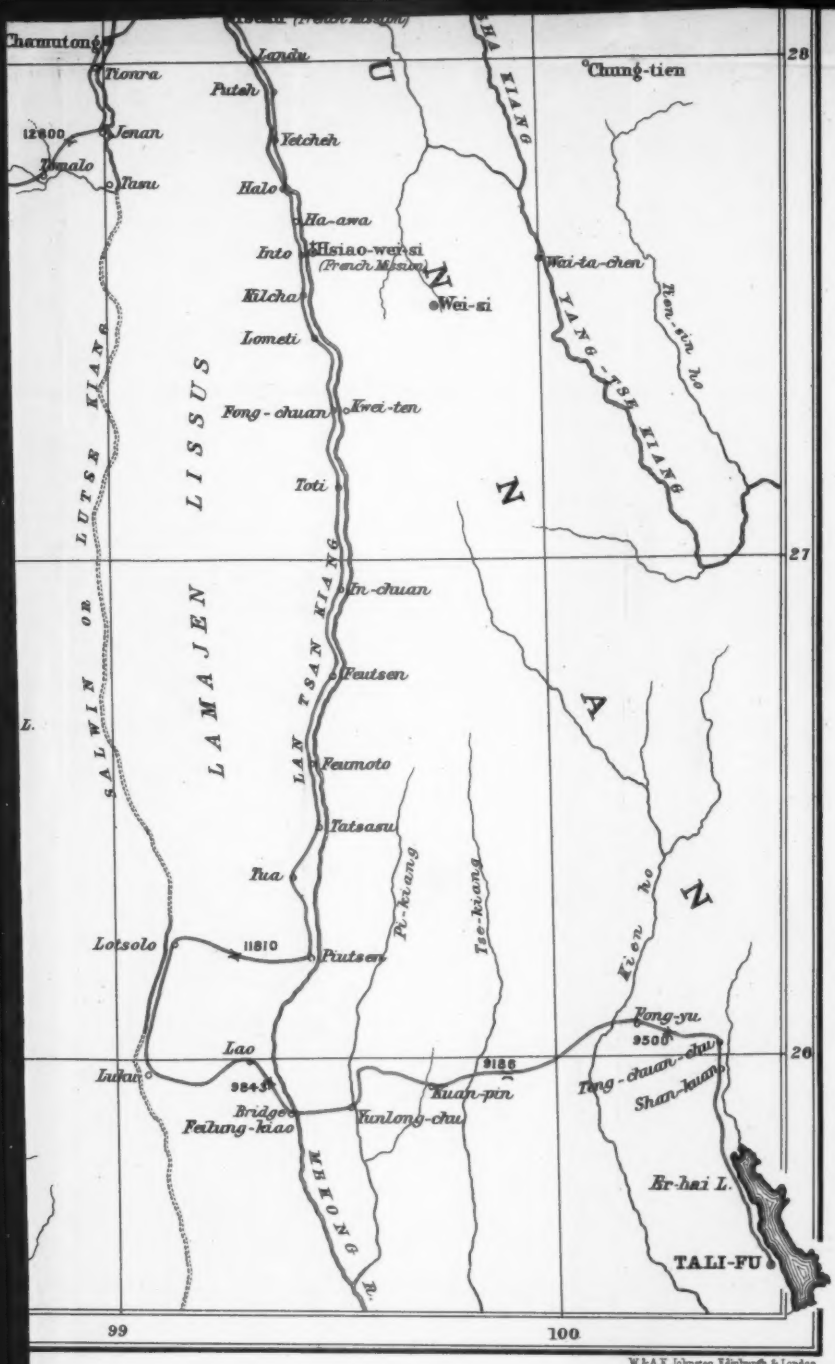

W. & A.K. Johnston, Edinburgh & London

SOUTH PACIFIC
NEW HEBRIDES ISLANDS

AMBRYM ISLAND

Surveyed by Commander H. E. PUREY-CUST.

Assisted by Lieutenants W. Pudsey Dawson, F.C.C. Pasco, & A.E.H. Marescaux

H.M. Surveying Ship 'Dart,' 1893-4.

All heights are expressed in feet above High Water Springs.

100 FATHOMS LINE

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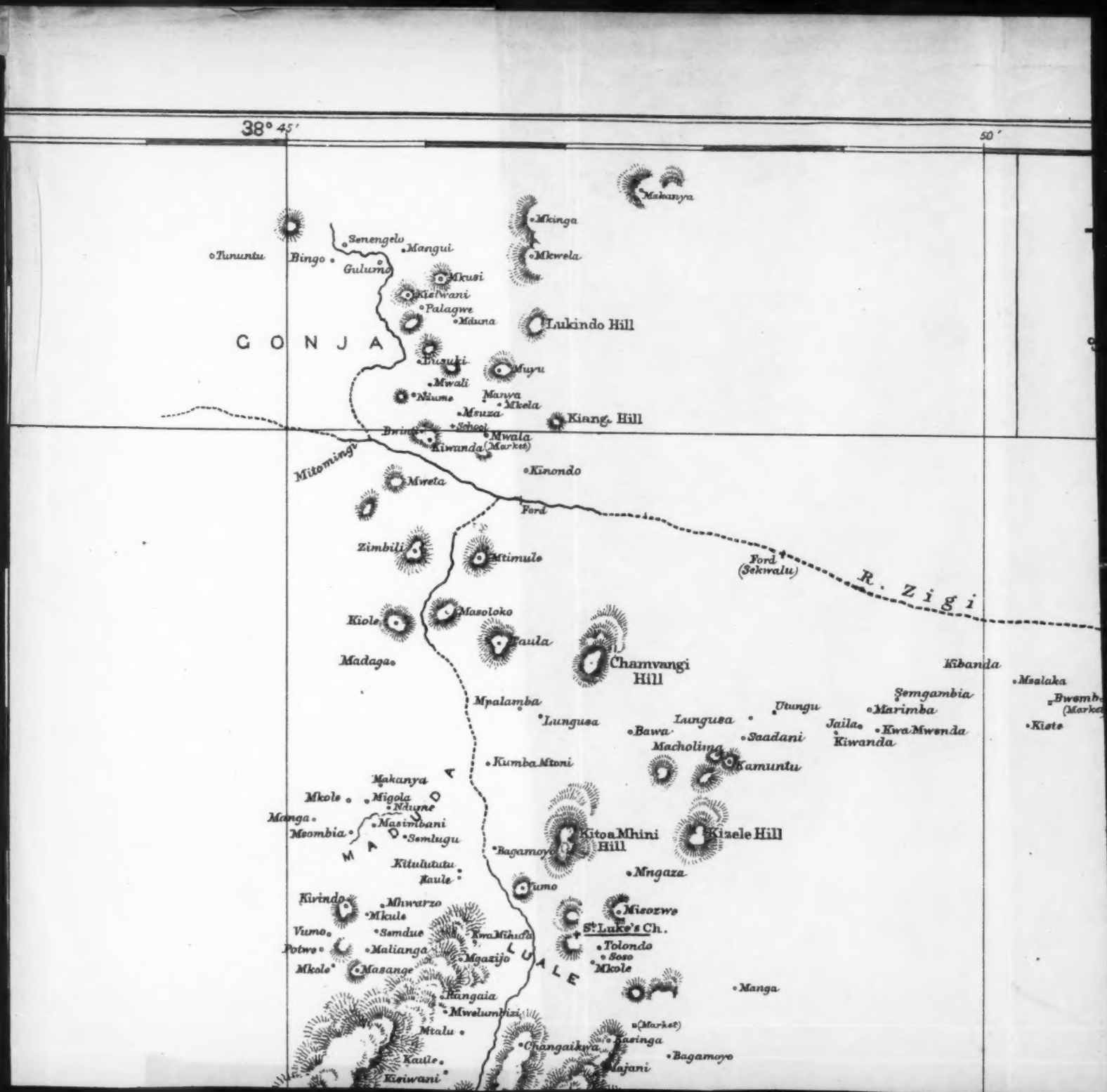
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Senengelo
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Kiswani
Palagwe
Mduna
Lukindo Hill
CONJA
Buzuki
Muyu
Mwali
Nkume
Manya
Mkela
Msuza
Kiang. Hill
Schoo
Mwala (Market)
Kiwanda
Mitomingi
Kinondo
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Ford
Zimbili
Mtimule
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Kiole
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Kamuntu
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Mkole
Migola
Nduine
Manga
Masimbani
Msombia
Semlugu
MADYA
Kitoa Mhini Hill
Kizele Hill
Bagamoyo
Kitulututu
Kaule
Mngaza
Vumo
Kivindo
Mhwarzo
Mkule
Miezwe
St. Luke's Ch.
Vumo
Semdue
Kwa Mhuta
Potwe
Malianga
Tolondo
Soso
Mkole
Mgazijo
Masange
Mkole
LUALE
Manga
Rangaia
Mwelumbizi
(Market)
Mtalu
Changaikwa
Kaule
Kaule
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Bagamoyo
Majani

MAP OF
THE BONDE COUNTRY
(EAST AFRICA),

Surveyed by the Rev. H. W. WOODWARD.

Scale of Miles.

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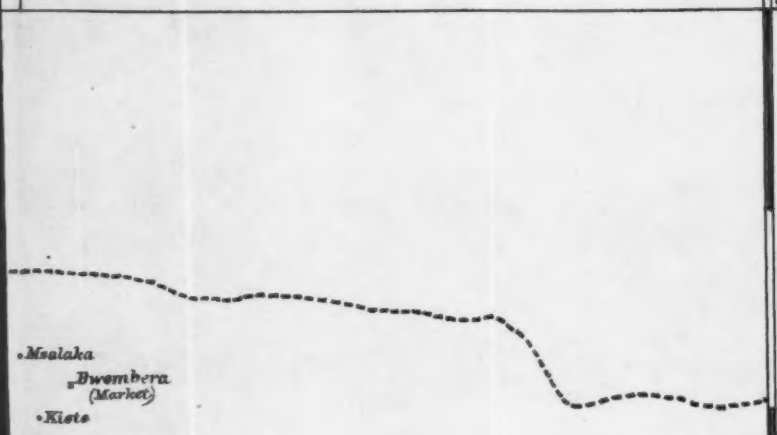
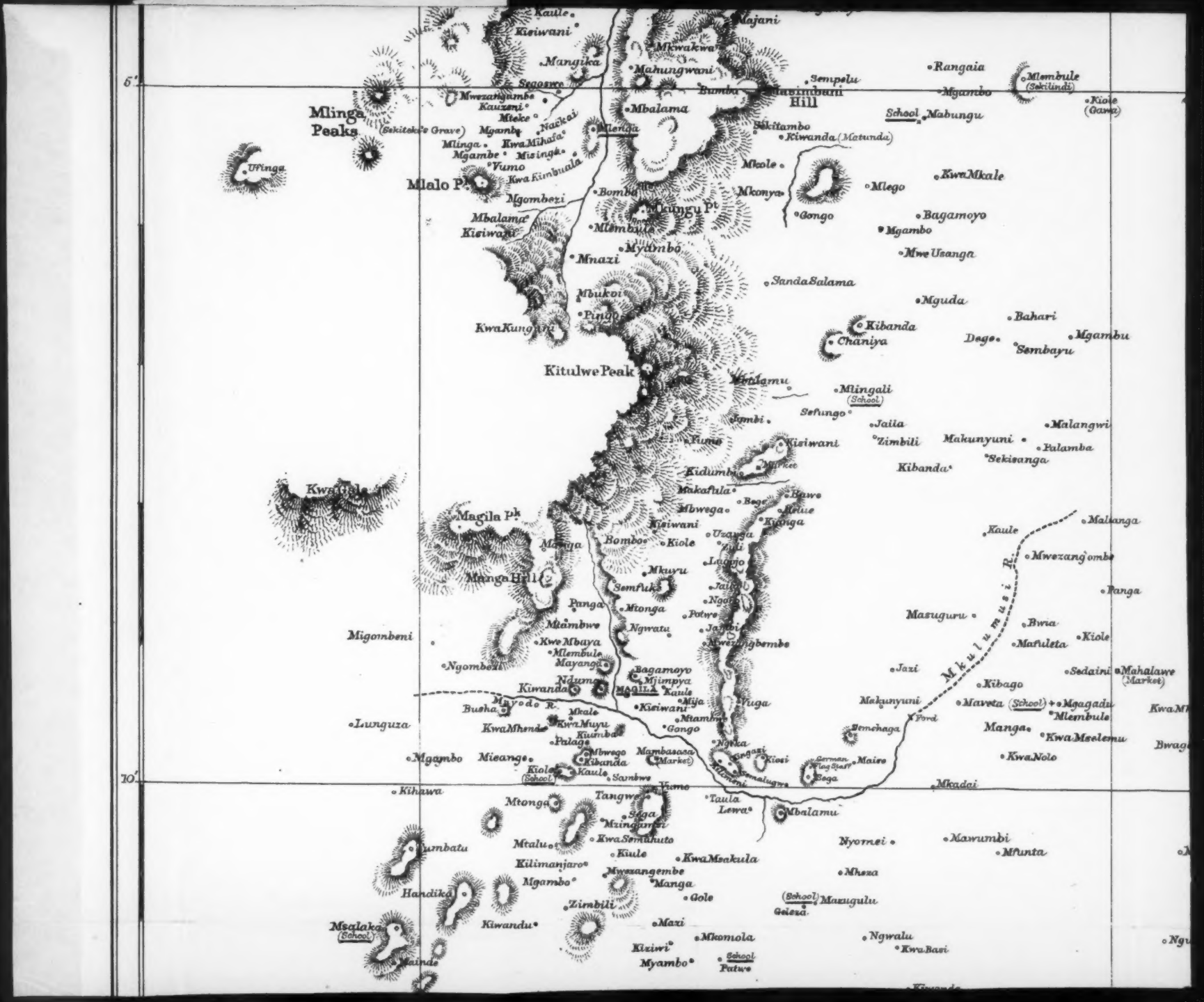
1894.

Mission Station and Schools are underlined.




Kaule
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Mahungwani
Rangaia
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Kasimbani Hill
Mgambo
Mwezangombe
Kauzeni
Mieke
Nackai
Mbalama
Mlinga Peaks
(Sekiteki's Grave)
Mgamba
Mlinga
Kwa Mihafa
Mgambe
Misinga
Yumo
Kwa Kimbuala
Mlalo Pk
Mgombezi
Bombo
Mkonya
Mlego
Kwa Mkale
Ufinga
Mbalama
Kisiwani
Mlembule
Mlungu Pt
Congo
Bagamoyo
Mgambo
Myambo
Mnazi
Mwe Usanga
Sanda Salama
Mbukoi
Pingo
Mguda
Bahari
Kwa Kungwini
Kibanda
Chaniya
Dego
Mgambu
Sembayu
Kitulwe Peak
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Sefungo
Jambi
Jaila
Malangwi
Yumo
Kisiwani
Zimbili
Makunyuni
Palamba
Sekisanga
Kibanda
Kidumbi
Makatula
Bawe
Mbwega
Kilue
Kisiwani
Kiunga
Kaule
Malanga
Uzanga
Bombo
Kiole
Mzuya
Zuli
Mwezangombe
Lungo
Mkuyu
Magila Pk
Manga Hill
Semfuki
Panga
Mtonga
Potwe
Ngwatu
Mtambwe
Kwe Mbaya
Migombeni
Mlembule
Mayanga
Ngombezi
Bagamoyo
Mjimpya
Nduma
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MAGILA
Kaule
Busha
Mkale
Kisiwani
Mtambwe
Yuga
Lunguza
Kwa Mhenda
Kwa Muyu
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Palago
Gongo
Mgambo
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Mbwego
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Mambasasa (Market)
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Mkadai
Mtonga
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Mtalu
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Congo
Bagamoyo
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Dego
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Ford
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Kwa Nolo
Bwage
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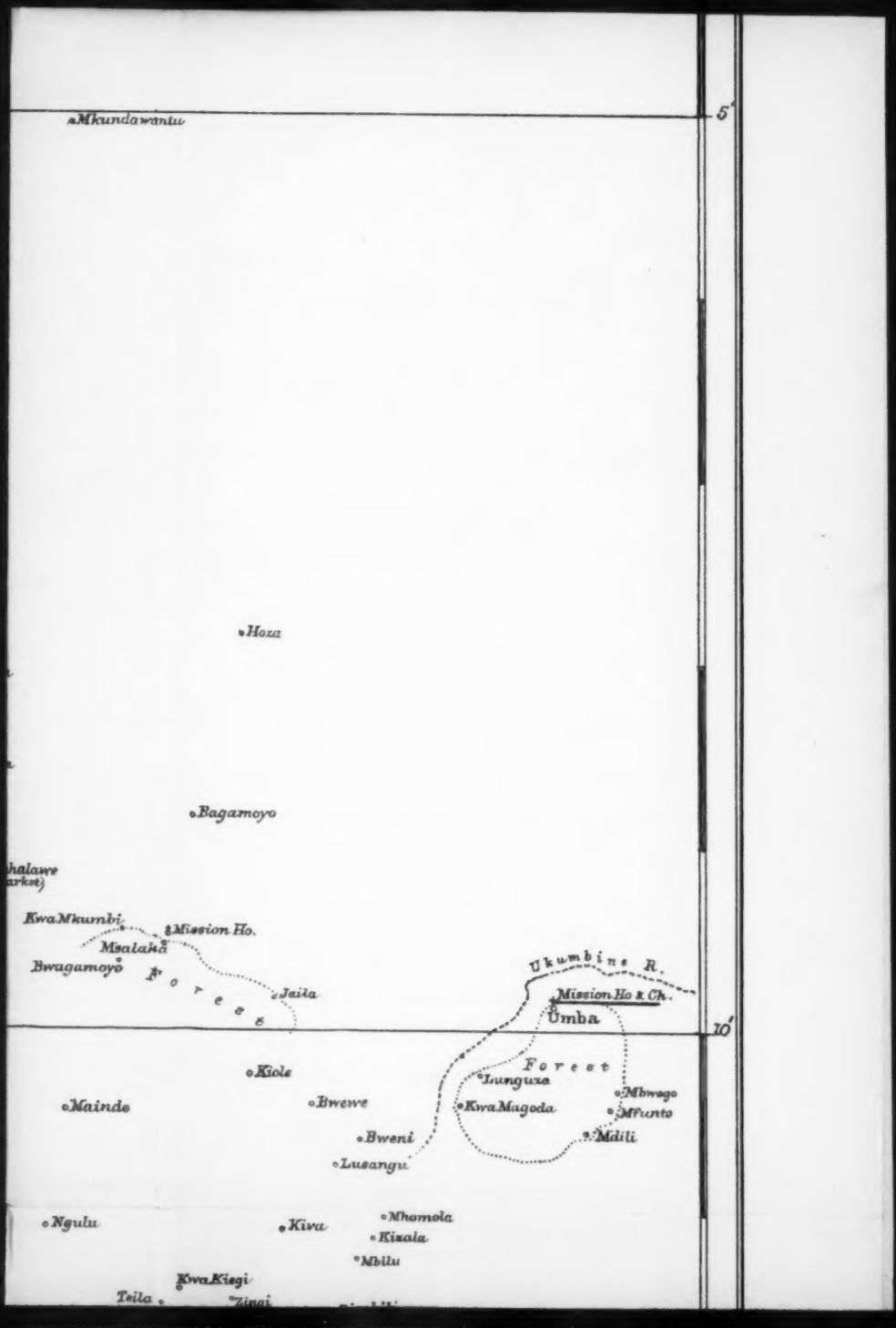
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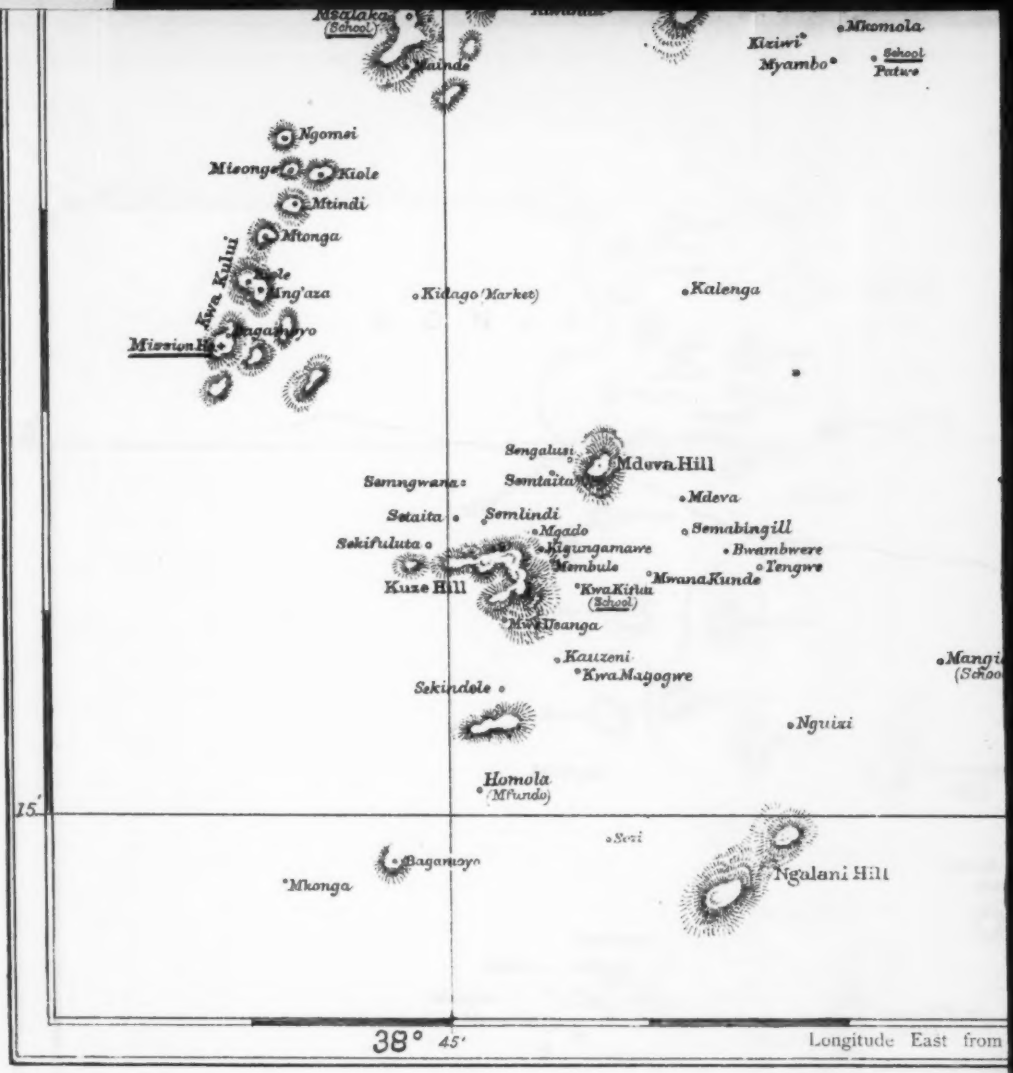
Teila
Zingi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Mdeva Hill
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Semlindi
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Semabingill
Sekifuluta
Kigungamawe
Bwambwere
Membule
Tengwe
Kuze Hill
Mwana Kunde
Kwa Kifua
(School)
Mwa Usanga
Kauzeni
Mangi
(Schoo
Kwa Magogwe
Sekindele
Nguizi
Homola
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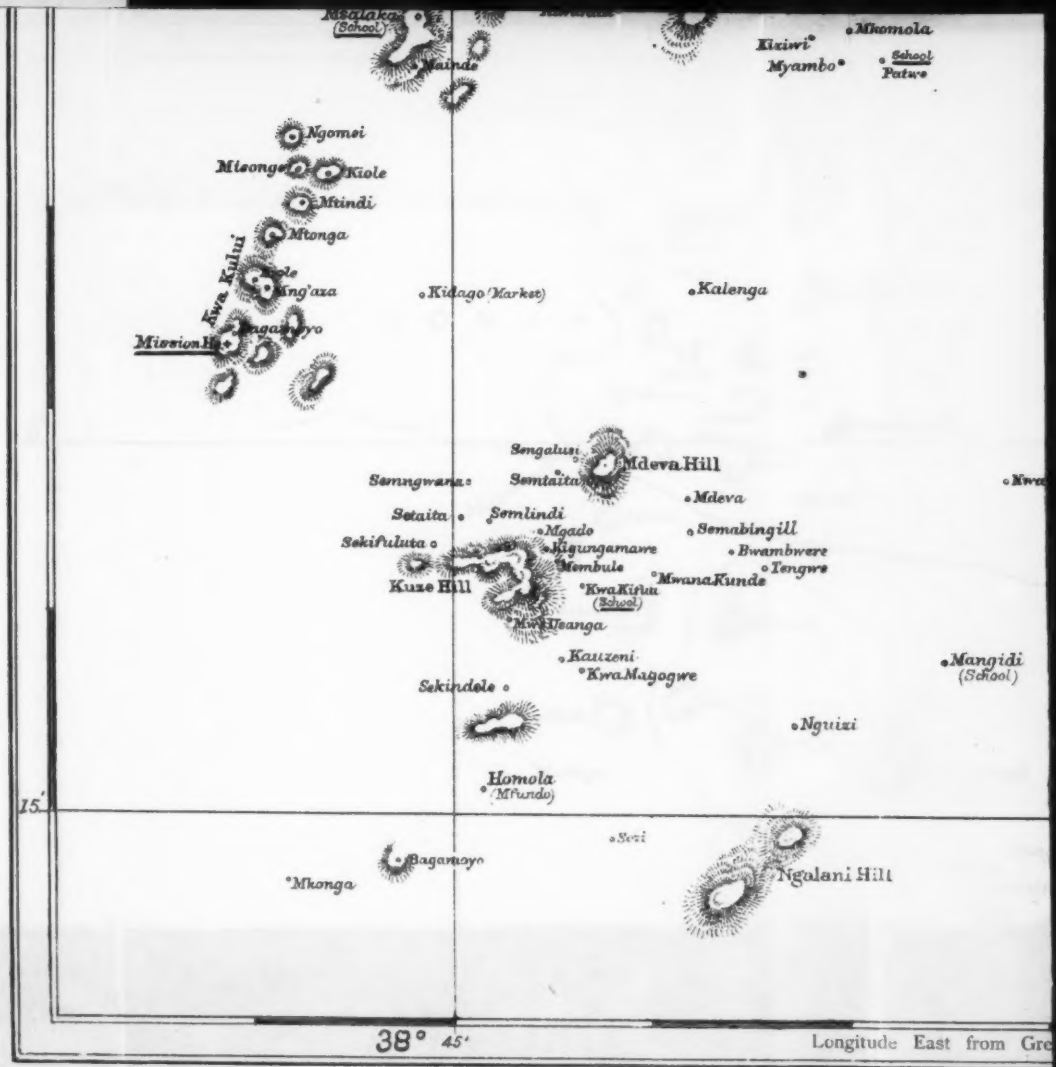
Changaikwa
Kasinga



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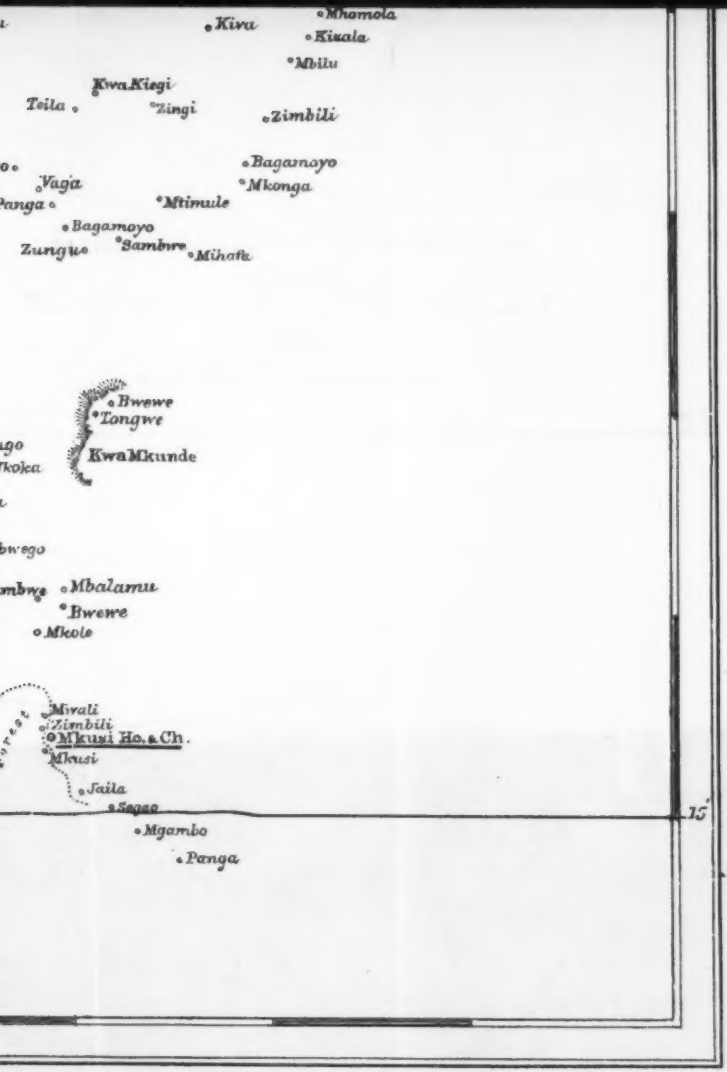
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